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HÆMATOMYELIA.

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Most authorities are agreed that spontaneous hæmatomyelia or hæmorrhage into the spinal cord is comparatively rare. Recently the subject has been brought up again and various pathological findings have been discussed. Holmes,[1] who describes a typical case in which a good recovery occurred, gives a graphic account of the sudden onset with complete paralysis and shock. He stresses the cerebro-spinal fluid findings and suggests a spinal hæmangioma as the probable cause. He also mentions syphilis as a possible contributing factor in older subjects. He gives useful references, one citing congenital syphilis in a child.

Buckley[2] also describes a case secondary to a hæmangioma and stresses the rarity of the condition, that is, apart from injury. His patient was twenty-four years of age and had had a long history of odd pains in the shoulder, arms and back. His spinal fluid contained blood; paralysis set in quickly and delirium followed by stupor ended in death after five days. At *post mortem* examination a fusiform swelling was found in the spinal cord at about the fifth and sixth spinal segments. On section the swelling turned out to be a hæmorrhage involving half the diameter of the cord; as usual, it tended to spread by way of the posterior horns. The pial vessels were tortuous, dilated and engorged, and bloody fluid was present in the dural sack. The vessels were enveloped in a zone of inflammatory

reaction, that is, œdema and round-celled inflammation. The main finding, however, was a mass of irregularly developed blood vessels in some levels occupying the entire thickness of the cord. Buckley discusses the question of tumour or telangiectiform formation and gives anatomical reasons why the cervical area should be involved.

Clifford Richardson[3] in a longer article describes several cases and also stresses intramedullary angiomata and syphilis as possible causes. He quotes R. T. Williamson and his account of the long lateral spinal vessels, and puts forward their length as a reason for their relative immunity to rupture. Some of his illustrations are singularly like those of our own cases. He uses the expression "old hæmatomyelia occurring in connexion with syphilitic meningomyelitis", and his last patient did not die. He suggests that spontaneous hæmatomyelia should be considered as a primary non-traumatic hæmatomyelia and probably always due to disease or developmental malformation of the vessels of the spinal cord.

Experiences in New South Wales.

During the last twenty-eight years we have in our laboratory had occasion to examine over 400 brains, 42 spinal cords and a further 88 brains with their cords. This series represents what clinicians decided to send us, and of course but few gross cerebral hæmorrhages would have been included. However, the series included 150 brain tumours and about 10 spinal tumours.

Most of the other brains would have shown arteriosclerosis and indefinite encephalitis, and the spinal cords some tract myelitis. We found but four cases of gross hæmatomyelia and a further five in which the condition was less conspicuous. It has long been known that hæmorrhages commonly produce some interference in nutrition, especially in the supporting glia, and at times an axonal degeneration—a slowly developing death of the neurone and its axis cylinder and myelin sheath. In these cases the brittle cord is hard to section, and quite soon, after three or four days, clumps of swollen axis cylinders may be observed round the periphery. Often very large vessels, chiefly veins, deeply engorged, may be seen in the pia and nerve roots; and while local conditions may determine such varicosities, care should be taken not to miss a congenital abnormality of the circulation. For instance, R. M. Stewart[4] was examining a defective brain with one hemisphere much smaller than the other; noting a layer of deep cortical calcifications in the smaller lobe, he noted also in the pia-arachnoid covering this region several small veins with faulty development of their walls, the sole evidence of an angioma.

The question whether obviously abnormal vessels constitute a real tumour or only a varicosity was well discussed when Dr. Lindau,[5] of Sweden, visited a joint meeting of the Sections of Neurology and Ophthalmology of the Royal Society of Medicine in November, 1930. The relative absence of nervous elements between the various vessels would probably justify a diagnosis of angioma. It remains to be added that even gross trauma is surprisingly rarely accompanied by severe hæmorrhage into the spinal cord, so immune are its vessels to rupture compared with those of the brain.

Case Histories.

Hæmangioma of the Cord.

Case I.—Dr. A. A. Palmer asked me to examine part of the cord of a man, aged thirty years, who had jumped a few feet to the ground and had jarred his neck. Fourteen days later he consulted a doctor for pain in the neck, which had been present since the jump. Three weeks later he was found sitting at the bottom of the stairs complaining: "I have had a stroke", and then: "I have a pain in my heart and I cannot lift my arm". He died that day in hospital. The *post mortem* examination revealed some atheroma of the coronary arteries and some hæmorrhage into the upper part of the cord, just below the medulla and for some two inches down. Blood was present between the atlas and axis vertebræ posteriorly (see Figure Ia). The top few inches of cord were received in 10% formalin solution, and after it had been sectioned longitudinally and otherwise, sections were prepared by hæmatoxylin and eosin, Weigert-Pal, Busch-Marchi and Cajal's silver methods, and the remainder was mounted as a museum specimen.

Such sections showed the cord to be swollen to nearly three times the normal size and to be the seat of a recent hæmorrhage or hæmatomyelia involving almost two-thirds of its diameter in one place and burrowing as usual up and down the cord by way of the posterior horns (see Figure Ib). No chronic myelitis was revealed by the Weigert-Pal method of staining, but the Marchi method revealed a few degenerating myelin fibres around the hæmorrhage. By hæmatoxylin and eosin one could readily make out some 38 thick-walled vessels (possibly veins) in the centre of the hæmorrhage, and many more in the pia and up to three millimetres across. One of these vessels about the level of the second cervical vertebra, with hyaline degeneration like an artery, had obviously ruptured and caused the mischief. The lesion was judged to be an angioma, and it was considered surprising that so little cord degeneration was evident.

We had on a previous occasion a similar spinal cord angioma[6] with much larger vessels, which showed extensive old myelitis but practically no vascular leak at all. Compensation was obtained in the first but not in the second case, though in both symptoms were associated with violent exertion.

Meningohæmangioma of the Conus Medullaris.

Case II.—A female patient, aged forty-seven years, came under the care of Dr. George Bell and Dr. K. Noad for symptoms including progressive paraplegia coming on during the previous ten months. Examination suggested a complete spinal blockage or lesion about the first lumbar vertebra. After laminectomy had been performed pulsation could be seen in the cord down to the level of the eleventh dorsal vertebra.

The *conus medullaris*, instead of tapering to a point, was seen to be expanded and swollen like an inflamed appendix, so that it impinged against the enclosing dura, obstructing the flow of the spinal fluid. No blood clot was observed and on incision of the dorsum of the cord a hæmatogenous tumour mass was found at a depth of about three millimetres. At first it looked as if it could be easily shelled out, but this was found impossible, as it was incorporated in the cord, so that beyond excision of a piece for examination no radical operation was done.

A paraffin section of a piece of tissue about eight millimetres across was made by Dr. Shearman. The tissue resembled in structure something between pia and dura. It contained many lacunæ, which included single and groups of endothelial cells; the vessels were somewhat thick-walled and innumerable hæmorrhages into the tumour mass and neighbouring tissues undoubtedly increased its bulk and possibly aggravated the symptoms. The tumour was adjudged a meningohæmangioma.

Hæmatomyelia Associated with Syphilis.

CASE III.—A carter, aged forty-two years, married, was loading bales of chaff onto a railway truck when he was seen to falter and then to fall onto the truck, some seven or eight feet below. The importance of an accurate history is here evident. Evidence before a court of compensation elicited the fact that the man seemed to have had a fainting turn and then fell down. Moreover, he fell onto his shoulder and outstretched arms as well as striking his head; and these facts with others influenced a competent neurologist to diagnose "ruptured brachial plexus". Four provisional diagnoses were made: (i) He slipped and damaged his brachial plexus, besides hitting his head. (ii) A small brain hæmorrhage had resulted from the fall onto his head. (iii) A congestive attack, such as that seen in general paralysis of the insane, had occurred. (iv) A primary cerebral hæmorrhage took place. No one suspected a spinal mischief. As the man was stunned and quite paralysed he was removed about sixteen miles to hospital, by which time he had recovered consciousness. As his was an insurance case, the interested bodies had him under the constant observation of well-recognized neurologists. He complained of shoulder pains and headache. In twelve hours all his limbs had recovered some use save the right arm, even the pectoral muscles being intact. By five weeks definite paralysis of the deltoid and shoulder rotators was present. On the eighteenth day there was response to faradism, and power was present in the extensors of the fingers and small muscles of the hand. Response to galvanism was also noted. Mental symptoms developing in five weeks, he was admitted to Rydalmere Mental Hospital, where Dr. Prior readily recognized general paralysis, and furthermore, by tape measurement, found that the right arm and leg were inches less in circumference than the left. This suggested something more central than a brachial plexus lesion. The right arm and forearm were wasted and there was pitting on pressure. Blood serum and spinal fluid reacted to all tests for syphilis.

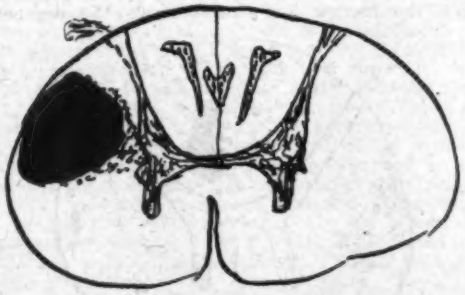

FIGURE II.

Drawing of cross-section of spinal cord at the centre of the lesion in Case III. The Weigert-Pal preparation revealed an extensive area of demyelination and remains of scavenging, marked black, and involving part of the lateral pyramid and direct cerebellar tract. The bilateral tabetic demyelinations in the posterior tracts are in stipple. Level: between third and fourth cervical segments. (x 9.)

On the patient's death some fourteen months later there were no obvious signs of hæmorrhage, but on naked eye examination and microscopically the brain was seen to be typically paretic. The cord too was sectioned from the lower lumbar levels to the top, and slides were prepared. By the use of hæmatoxylin and eosin, sudan IV, Weigert-Pal and Marchi stains two separate types of lesion were discovered. Firstly, in the cervical levels bilateral symmetrical, typical, tabetic demyelinations in the tracts of Goll and Burdach were revealed; and secondly, at about the fourth cervical segment a large patch of demyelination with phagocytes still in evidence was obvious, involving parts of the lateral pyramid, ascending cerebellar and neighbouring parts (see Figure III). This lesion was, of course, accompanied by typical ascending and descending secondary degenerations. The original lesion must have extended up and down the cord for quite a centimetre, since several levels showed an all-embracing picture, such as would eventuate from a vascular catastrophe of some magnitude. Part of the grey matter was involved too.

Dr. A. W. Campbell, who had seen the patient from the first and who appeared with me at the Compensation Commission, on the added neuropathological evidence, gave out the probable sequence of events as follows: Syphilitic arteritis in the spinal cord of a man not in training (he had been on the dole for years) caused on exertion a vascular accident leading to a hæmorrhage into the cervical area of the cord, and the whole incident had probably hastened the manifestations of the symptoms of general paralysis. The initial hæmorrhage caused general motor symptoms, and when these passed away the residual paralysis could be picked out.

Syphilitic Myelitis.

CASE IV.—The patient had been admitted into the Royal Prince Alfred Hospital many years ago with symptoms of transverse myelitis. His blood and spinal fluid had yielded a positive Wassermann reaction. Only part of the lumbar cord about the first lumbar segment and also some segments higher up in paraffin sections and stained by hæmatoxylin and eosin were given us. The outstanding features of these sections were that almost all the grey matter of one side and most of the posterior horn of the other side were occupied by a telangiectiform formation of small blood vessels, often accompanied by fibroplastic formation, with innumerable lymphocytes and plasma cells. The larger vessels also had cuffs of mononuclear cells, and the smaller vessels had some endarteritis. All over the cord sections were patches of myelitis, and in the dorsal columns were patches of softening, some filled with hæmorrhage, others with *Gitterzellen*, and some with both. Innumerable hæmorrhages surrounded the peculiar vessels in the grey horn. The lesion was adjudged a gummatous reaction.

We have had but one other syphilitic cord with outstanding blood vessels. This cord, however, while exhibiting no hæmorrhage, was the seat of a most extensive combined sclerosis. Ordinary tabetic and tabo-paretic cords usually reveal nothing like this.

Hæmatomyelia of Unknown Origin, Possibly on a Myelitic Basis.

CASE V.—T.E.N., aged sixty-six years, married, gave a history of moderate potus and also of influenza during the great epidemic. He suddenly fell down in the street and was carried home unconscious. However, he soon came to himself and complained of numbness of the arms and of loss of power in his legs. On admission to the Royal Prince Alfred Hospital two days later these symptoms were confirmed. His arms were weak and felt heavy, and the patient could not pass urine or fæces. On examination the pain was found to be absent below the spine of the twelfth dorsal vertebra; some irregular feeling was evident up to the fourth dorsal vertebra; hyperæsthesia was present at the fourth dorsal segment and sensation was normal above this level. There was also analgesia along the ulnar aspect of the forearms and hands, excluding the thumbs.

There was no sense of passive position or of the passage of a catheter or of bladder fullness. At first the patient's conjunctival and pupillary reflexes were normal and a positive Babinski reflex was present. His elbow jerks and supinator reactions were bilaterally positive, while his wrist jerks were absent, and neither patellar nor ankle clonus was present. Incontinence of urine and fæces developed; and the patient's expression and mental condition became dull, although his speech was normal. The functions of the third, fifth, seventh, eighth and twelfth cranial nerves were normal, but the pupils became irregular. About this time the patient could straighten but not lift his right leg; he could just move his left leg. There was weakness in all the arm movements, and flaccidity of the hands and left leg were noted. Movements of flexion were better preserved than those of extension. The patient's tongue remained moist and clean, and his heart and chest were clear almost till his death eleven days later. His serum did not react to the Wassermann test.

The *post mortem* examination revealed chronic tuberculosis and chronic nephritis, and Dr. W. E. Rennie and Dr. J. Briton Langdon, whose patient he was, suggested some form of transverse myelitis. Preparations of several levels of the cord by methods of Weigert-Pal, hæmatoxylin and eosin *et cetera* showed the grey matter to be the seat of innumerable and extensive capillary hæmorrhages, while there was great loss of myelin fibres all through the dorsal and lateral tracts, with capillaries exhibiting arterio-capillary fibrosis and obliteration.

Funicular Hæmorrhage into a Myelitic Lesion in the Cord.

Case VI.—A female patient, aged twenty-six years, of Italian lineage, had always enjoyed perfect health save for an undiagnosed illness at the age of five, during which she had slept much. Seven days before her admission to hospital, after partaking of a hot bath and cold shower one night, she developed severe burning pains in her legs and low down the back. In the morning the legs were weaker and numb, and the pains persisted but were less severe. Clinical examination at hospital revealed that she could scarcely move her legs or feel the blankets on them, and that they felt numb. There was no headache, shivering or malaise, but micturition was difficult.

Lumbar puncture revealed a yellow fluid full of red blood cells, evenly mixed. The pressure was 180 millimetres of water, with a normal Queckenstedt reaction. Later the fluid was clear and colourless, with chlorides at 680 milligrammes *per centum* and at normal pressure. At no time were the white cells in excess. Meanwhile the blood examination revealed a leucocytosis of 13,000 per cubic millimetre, with polymorphonuclear cells at 88%. Some days later the spinal fluid contained blood again; the globulin content was increased, the sugar was 61 milligrammes and the total protein content was 200 milligrammes per 100 cubic centimetres.

The neurological examination showed the cranial nerves to be healthy. There was practically a complete flaccid paraplegia. The patient could rotate the legs, but they were very weak, extension, flexion and abduction at the hip, knee and ankle being quite lost. Body movements above the hip joint seemed normal. Muscle, joint and vibration sense seemed quite lost over the whole of both lower limbs, while pain and temperature sense and sense of light touch were not so severely affected below the knee. Above this level they seemed fairly good, and therefore scarcely conformed to strict segmental law.

Reflexes were as follows. On both sides the plantars were flexor and sluggish. The wrist and elbow jerks were present. The knee jerks were absent. The ankle jerk, patellar clonus and ankle clonus also were absent.

After a month in hospital the patient developed a high temperature; trophic ulcers appeared in the sacral region; asthenia and death ensued quickly. The clinical diagnosis was acute myelitis.

Post mortem examination revealed only pyelitis and cystitis. The spinal cord was received by us in 10% formalin solution, and ventrally, beneath the pia at about the level of the sixth to eighth dorsal segments, some slight hæmorrhages, six to seven millimetres across, were visible. The cord was sectioned here and at most other levels, and with the naked eye one could readily note a hæmorrhagic spot, four to five millimetres in diameter, apparently the cross-section of a funicular hæmorrhage extending up most but not all the levels of the cord. It was not present in the upper cervical and a few of the dorsal levels. It varied in size and shape and position, sometimes occupying the inner aspect of one tract of Goll; at others it crossed the medium septum and then was accompanied by rusty staining and appeared to be part of an area of softening. Appropriate staining revealed that this girl had a posterior myelitis or degeneration of the myelin fibres in Goll's and Burdach's tracts from her sacral region up. The inner part had developed an area of recent softening and in this special softened area both older and more recent hæmorrhages were present (see Figure IVA). There were some smaller patches of degeneration in one direct cerebellar tract and on the other side in the antero-lateral region. As one proceeded upwards through the lumbar and dorsal levels the degenerated myelin confined itself more and more to the more central area, till in the middle cervical region almost a complete outlining of Goll's tracts was seen (see Figure IVB). In other respects the lesions resemble those found in Case IV.

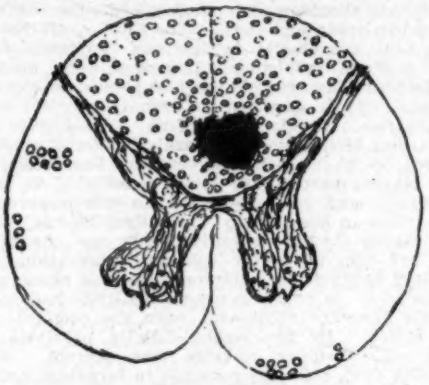

Figure IVA.
Cross-section of the cord in Case VI. About the lumbar area almost the whole of the dorsal columns is affected by some demyelination, and there there are similar lesions elsewhere (marked in small circles). In Goll's tract nearest the central canal is an area of softening into which old and recent hæmorrhages are evident. This place is recognized by L. Minor as specially prone to vascular blocking.

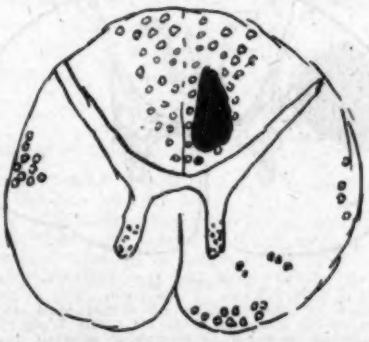

Figure IVB.
Cross-section of the cord in Case VI. This is at a higher level than the section shown in Figure IVA. The hæmorrhage is confined to one side and the demyelination becomes confined to Goll's columns.

This case seems to show that a person may be the victim of an extensive posterior demyelination and reveal no clinical symptoms until a hæmorrhagic catastrophe of quite medium dimensions occurs, when, with the usual suddenness and completeness apparently common to all spinal blood spillings, the patient becomes at first quite knocked out and then recovers his senses and some of his power and feelings. Sufficient horn cells showed axonal degeneration to account for much paralysis.

Extensive Hæmatomyelia, Probably Following upon Cord Softening Caused by Fracture of the Spine.

Although it was my intention to confine this paper to cord hæmorrhages which were entirely spontaneous, in other words occurring apart from violence, yet even in spinal fracture and falls hæmorrhages such as were revealed in the following case are quite rare. While the finding of fractured laminæ near the level of the main hæmorrhage strongly suggests the ætiology of the hæmorrhage, the hæmorrhage might have caused the fall; and one must never assume the apparently obvious without considering all the pros and cons.

Case VII.—A man, aged fifty-two years, gave no other particulars about himself beyond the facts that walking downstairs in a house in my neighbourhood he fell and was found at the bottom, unable to move; he thought that he was suffering from shock. Later he complained of numbness in his legs; he said that they felt a dead weight, that he felt pins and needles in his arms and some pain near his shoulders. On admission to the Royal Prince Alfred Hospital, under the care of Dr. Rennie and Dr. Poate, he was found able to converse rationally. His bowels had operated the day previous to his mishap. He was found to have paralysis of his legs and pain and rigidity in his arms, and to have constant vomiting of projectile type. He had no sensation in his abdominal wall, and his abdomen moved with respiration. His breathing was of the abdominal type.

Further examination revealed exaggerated knee jerks and positive Babinski reflexes on both sides. Sensation was practically non-existent up to the first dorsal vertebra, where a zone of hyperæsthesia became apparent. He could move his arms, and sensation there was moderately good. Catheterization of the bladder was necessary. Laminectomy having been decided on, an incision over the spine of the seventh cervical vertebra showed both laminæ of the spine of that vertebra broken off and free. These were removed as well as those of the sixth cervical and first dorsal vertebræ. The cord was seen to be pulsating normally, there was no sign of any hæmorrhage or other abnormality, and on puncture the spinal fluid escaped slowly and not under increased pressure. The patient stood the operation well, and next day his temperature had fallen after reaching 38·3° C. (101° F.). He had lost power in his thumbs and forefingers. Death took place about the fifth day.

Post mortem examination proved the removal of three laminæ and a few fragments of bone were found. The body of the fifth dorsal vertebra was found fractured. About seventeen centimetres of spinal cord were removed and sent to us. On inspection the upper seven centimetres had been somewhat crushed in removal and the normal grooves on the cord surface were accentuated. Nothing noteworthy was apparent until a swelling in the cord just below the cervical enlargement was cross-sectioned, when it was seen that a hæmorrhage had taken place into the grey horn. On further cross-sectioning the sequence of events was as follows. Five centimetres from the top end of the cord a linear hæmorrhage was present in the right posterior horn. Five and a half centimetres from the top of the cord portions of all the grey matter were affected. Six centimetres from the top of the cord a large hæmorrhage was present in the right anterior horn and smaller hæmorrhages were present in the left. At a level of seven centimetres the hæmorrhage was smaller. At seven and a half centimetres the hæmorrhage became larger. At eight centimetres the hæmorrhage became so large as to churn up most of the grey matter and part of the white matter. At nine centimetres smaller areas were involved. At nine and a half centimetres only small streaks were present in the posterior horn. Many red cells were still present; some of the blood was disintegrating (see Figure V).

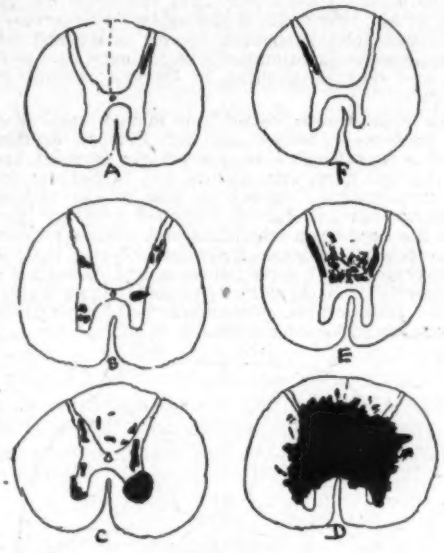

Figure V.

Drawing of six levels of the cord in Case VII, with the main hæmorrhage at *D*. At *D* almost all the grey matter was churned up, and in the other levels the hæmorrhagic tracking along the posterior horns is seen. The museum specimen did not lend itself to good photography.

A careful examination of many levels of this cord after suitable staining revealed: (*a*) many typical groups of swollen axis cylinders round the periphery, (*b*) many so-called amyloid bodies, which here were obviously of different ætiology. Some were altered cells and some were products condensed out of the tissue fluids. Axonal degeneration of many neurones was observed even where but little hæmorrhage obtained, and many areas of rarefaction (myelin atrophy) were seen round the periphery. A Weigert-Pal section above the hæmorrhage showed normal myelin tracts.

The sequence of events would appear to have been that the patient fell and struck the spine of the vertebra against the projecting steps of stairs. The shock of this, which was enough to fracture the body of one vertebra and the lamina of another, caused the lesion of compression myelitis. This is revealed by the groups of swollen axis cylinders and rarefaction. Then the nutrition suffered and some of the intraspinal vessels (which seemed to have had walls swollen by imbibition) ruptured, and thus the hæmatomyelia eventuated after some days in an area of commencing softening, causing the final increase of paralysis and death.

Toxic and Possibly Vascular Lesion.

Case VIII.—A male child, aged four years, of healthy family and personal history, had been out of sorts for two weeks. One day he was observed to have been unsteady on his legs, and two days later he fell off a fence, but could walk afterwards. The next morning his legs were paralysed and probably the trunk muscles too. During the day paralysis gradually developed in the arms as well. Next morning the patient could not swallow, and it was decided to admit him into the Royal Alexandra Hospital for Children. However, within six hours of admission the patient developed respiratory embarrassment and died.

Hospital notes record that the child was drowsy, had flaccid paralysis of his lower limbs and could not support himself in bed. Paralysis of the upper limbs became more evident, and soon dysphagia became a marked feature. The *post mortem* examination revealed only a large friable spleen and definite swelling of Peyer's patches in the small gut.

Pieces of the lower dorsal and lumbar regions of the spinal cord were handed us, and cursory examination revealed a protuberance in one lumbar segment anterior to one ventral horn. On section this turned out to be a recent hæmorrhage. Microscopically it was shown that the hæmorrhage had not only formed a cavity involving part of the horn from which the clot readily fell out, but that many smaller hæmorrhages had affected that ventral horn, sweeping away some neurones and damaging others (see Figure VI). Many parts of the overlying pia-arachnoid contained innumerable mononuclear cells, such as plasma cells, lymphocytes and polyblasts.

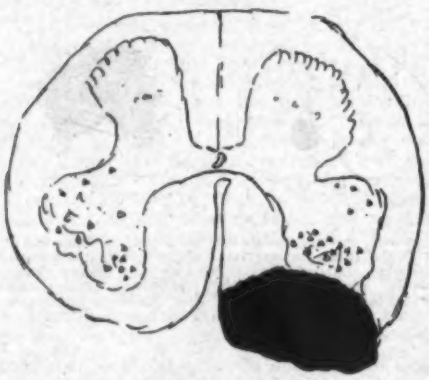

Figure VI.
Drawing of lumbar level in Case VIII, showing the hæmorrhage involving the ventral aspect of this cord.

This aseptic meningitis, together with the *post mortem* findings of a friable enlarged spleen and affected Peyer's patches, may well suggest an infective state as a basis for the vascular catastrophe.[7]

Multiple Small Hæmorrhages in a Case of Tetanus.

Case IX.—A motor driver, aged twenty-one years, had been treated for tetanus. The onset had been slow and there had been remissions in the symptoms. More vigorous treatment towards the end had included the introduction of antitoxin into the *cisterna magna*, and as the spinal fluid about this time began to contain some pus cells and to yield some *Staphylococcus aureus* on culture after being clear, it was deemed possible that some infection had been introduced. However, later withdrawals were sterile and pus cells were much fewer. The patient died suddenly after a rise of temperature to 40° C. (104° F.). The *post mortem* examination revealed no meningitis or tubercles or exudate, but some parts of the cortex and brain stem were unusually congested, and sections of various levels of the cord showed several small intraspinal hæmorrhages as well as excessive engorgement of pial and intracordal vessels. Dr. Keith Inglis asked me to examine these.

Microscopically there was a mononuclear infiltration of the pia, and very few polymorphonuclear cells were present. The engorgement of all the pial and intraneural vessels was extreme, and within the cord there were two circular hæmorrhages, about five millimetres across, in Goll's tracts, as well as many linear hæmorrhages more laterally (See Figure VII).

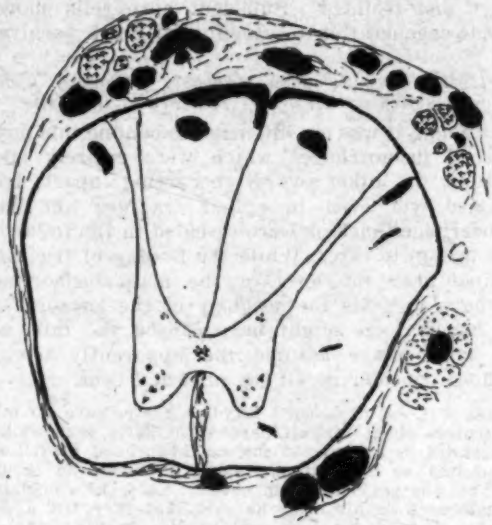

Figure VII.
Drawing of cross-section of the cord in Case IX. It was necessary to eliminate the possibility of the greatly engorged pial and intracordal vessels being pathological. The two circular sections of the small sausage-shaped hæmorrhages and dilated vessels are marked black.

No doubt the varicose condition of the vessels determined the bleedings, which, however, seemed scarcely important enough to have caused death.

Summary.

The rarity of not only true extensive hæmatomyelia, but even of hæmorrhages of minor degree in the spinal cord, has been our experience as well as that of those neuropathologists whom I have quoted from overseas; the causes have been as varied.

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INTRODUCTION OF THE SMITH-PETERSEN NAIL BY THE HEY GROVES TECHNIQUE.

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In selected fractures of the neck of the femur various methods of introducing the Smith-Petersen nail into the neck and head of the bone have been developed. In the open methods the fragments are exposed by an open operation, the position and length of the incision depending on the individual operator, while in the closed (so-called blind) methods a minor incision is made down to the side of the bone in the region of the subtrochanteric fossa.

A fundamental of the technique of the closed methods is accurately to place in position in the properly aligned fragments a guide wire on which the canaliculized nail is threaded and driven home. Enthusiasm and ingenuity have not been found wanting in the number of operators who have set out to accomplish this. The apparent relative simplicity of the technique and appliances designed and described by Hey Groves,[1] and their practical application in one of the several cases in which I saw Dr. G. Fenton employ the method at the Bendigo Base Hospital, encouraged me to try out this method in the case described below.

Report of Case.

A frail female, aged seventy-six years, was suffering from an unreduced medial fracture of the neck of the left femur of five weeks' duration (Figure I). On the night before operation 0·09 gramme (one and a half grains) of "Nembutal" was given. One hour before operation she was given a hypodermic injection of 0·015 gramme (one-quarter of a grain) of morphine. Spinal anæsthesia was induced. Hey Groves has recommended local anæsthesia and, when the nail is being introduced, gas and oxygen. The feet and half the legs had previously been put in plaster and a Sinclair's skate had been securely fixed to each foot by plaster bandages (I find this of additional advantage in attempts at the reduction of the fracture and in fixing the feet to the table.

Figure II is a reproduction of a skiagram showing the fracture reduced, with the notched caliper in position (held to the skin by adhesive strapping).

Two puncture wounds were made in the skin, one corresponding to the middle of the transverse axis of the head of the femur and the other to the intersection of the axis of the neck and axis of the shaft (determined by reference to Figure II).

A difficulty arose when, having placed the drill guide appliance in position on the skin, I felt what I believed to be the pulsating femoral artery under the point of the end vertical, which was to be thrust through the puncture wound in the skin down to the head of the femur. This accounts for the three guide wires, *W1*, *W2*, *W3*, introduced in the order named, and seen in Figures III and IV.

The drill guide was placed two centimetres (four-fifths of an inch) further out from its properly determined position, and wire *W1* was inserted (not shown separately in illustrations). Wire *W2* was next inserted, without the aid of the drill guide, at a point further down the shaft of the bone. I relied for direction on the projecting part of wire *W1*, keeping in mind the faulty position of the latter in both planes. Without the need of X rays the relations of the projecting parts of both wires showed this also to be incorrectly placed. Wire *W3* was then passed, with the aid of the drill guide, and placed in its originally determined position. As I still had a femoral artery complex, the point of the end vertical was introduced slightly lateral to its proper position and then corrected to its more medial position as the head of the femur was approached. Wire *W3* was the wire used for the introduction of the nail, which is shown in position in Figures V and VI. From the foregoing it will be seen that had the drill guide been placed in its determined position at the outset, the position of the wire would have been satisfactory.

Discussion.

Whatever method of introducing the guide wire is employed, difficulties and errors will arise, and in inverse ratio to the experience and skill of the operator and the soundness of the technique. A pooling of experience by independent operators in a large number of cases is necessary before a particular method can be evaluated and be found suitable for general adoption. Having these facts in mind, I have approached this article with two objects in view: first, to give a detailed experience with the Hey Groves technique; secondly, to point out some important details gathered from it and from experiments I had previously done on a number of femora with the drill guide in position.

Considering the average thickness of the neck of the femur to be 3·6 centimetres (one and two-fifth inches) and 2·5 centimetres (one inch) in the frontal and lateral planes respectively,[2] and the diameter of the nail 1·2 centimetres (half an inch), little margin of error is allowed for an incorrectly placed guide wire.

The Notched Caliper.

To avoid errors, such as foreshortening of the head and neck of the bone and distortion of the caliper, the frontal plane of the head and neck should, as far as possible, be parallel to the casette and caliper and at the same time at right angles to the central ray of the X ray tube. Before the points on the skin are marked it is a good plan to draw the outline of the caliper on the skin, thus obviating the difficulty should the caliper be displaced.

The Drill Guide.

A basic principle of the technique is the correct placing of the pointed verticals in their respective positions on the bone, so that when the guide-wire carrier is adjusted to the side of the limb, its canalized portion, which takes the wire, is set in the line of the central axis of the neck of the femur as well as being parallel to the horizontal carrying the three verticals. With the drill guide in position the pointed verticals should point directly towards the central axis of the neck of the femur; otherwise the guide-wire carrier will take up an incorrect position on the side of the bone, because, of course, the points of the verticals are eccentric to the central axis of the neck. In practice on the living this theoretically correct manœuvre cannot always be assured.

The design of the drill guide takes for granted a uniform conformation of the femur. Variations in the neck-shaft angle are obviously taken care of,

and I have been able to satisfy myself that variations in the torsion angle of the head and neck are automatically accounted for by the special design of the drill guide and the two selected anatomical points on the bone. Furthermore, these points are in positions where the natural moulding of the bone produces surfaces of even contour and at a safe distance from the irregular but usual markings of a typical adult femur.

Femora of abnormal conformation as a result of some developmental or previous pathological condition might obviously be unsuitable for the technique; but such abnormalities would be demonstrable beforehand.

Drilling the Wire.

The drill guide, while simplifying the drilling of the wire, should not be regarded as a robot. Even though an assistant is concentrating on holding the drill guide immovably in position, there is a tendency for the carrier to be levered out of position as the drill, especially a hand drill, is being operated. Direction of the wire can be more surely controlled if, in addition to relying on the direction it takes up when threaded in the carrier, the operator maintains the parallelism of the wire and horizontal of the drill guide. A reliable assistant checking this with a side-on or lateral view is a great help. This controls the direction of the wire in the lateral plane. One controls the direction in the frontal plane by seeing the three verticals from behind as one, by keeping the wire in the same direction as the horizontal, and by reference to a line drawn on the skin connecting the two puncture wounds and prolonged to the outer side of the limb. The modern type of drill, with its rectangular frame, facilitates attention to these details.

Measuring the Length of the Required Nail.

The method adopted by reference to the X ray film (Figure II), with the caliper in position, was correct in this particular case. Actual measurement on the film of the proposed position of the nail was 11·5 centimetres (four and a half inches). On the half-inch notched caliper, the shadow of which is assumed to be proportionately enlarged, this corresponded to 8·3 centimetres (three and a quarter inches), the actual length of the nail decided on.

While this method may give a fair degree of accuracy in the estimation of the length of the nail, and therefore the length of the wire to be drilled, errors may occur, owing to reasons I have already given, when the caliper is being placed in position. In any case, after the wire has been drilled and the incision made down to the bone, the length of the projecting part of the wire is a reliable check.

Allowance for the degree of impaction of the fragments, which is a necessary part of the procedure, as the nail is entering the head, is difficult to estimate exactly. In Figure V, owing to impaction with a slight tilting of the head of the bone, the end of the nail has reached a position further in than was intended. The technique assumes that the correct position of the nail is the central axis of the neck of the femur. Some authorities prefer the nail in a position nearer to the lower wall of the neck, where, according to Fraser,[3] this part of the bone, the *calcar femorale*, is thicker. More by accident than design, the nail in Figure V approaches this latter position.

Safety of the Femoral Artery.

The proximity of the femoral artery to the head of the femur, especially when it is remembered that the final manœuvre in reduction, internal rotation, tends to carry the middle of the transverse axis of the head more under the artery, introduces a risk that cannot be altogether disregarded. The pointed vertical requires a firm push and even a final tap with the mallet to ensure that it has reached its position on the bone.

Duration of the Operation.

Hey Groves states that the operation can be done in eight to fifteen minutes.[1] This should be so to one experienced and skilled in the technique, with a confidence in the unfailing accuracy of the appliance, and if it applies only to the least time-consuming parts of the full procedure, namely, placing the drill guide in position, drilling the wire, introducing the nail, and suturing the small incision. Preliminary arrangement of the patient on an orthopædic table, reduction of the fracture, radiographic control, and the temperament of the patient are some of the factors likely to upset one's calculations. If reliance could be placed on good fluoroscopic control instead of the taking and developing of X ray films, much time would be saved. There seems little need for speed. With suitable premedication and spinal anæsthesia the patient is comfortable and is merely roused when the nail is being driven in. The effect of prolonged counter-traction in the perineum must, of course, be taken into consideration.

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DIAPHYSECTOMY IN THE TREATMENT OF ACUTE OSTEOMYELITIS OF THE FIBULA.

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The value of diaphysectomy in the treatment of acute staphylococcal osteomyelitis of the fibula is not generally appreciated.

A survey of three thousand cases of acute osteomyelitis of the long bones reported in the literature shows that the fibula is involved in only 4%. The relative rarity of the disease therefore makes it impossible for many surgeons to speak from personal experience on the respective values of different forms of treatment. Most are guided by the general principles they apply to other bones, without giving due consideration to the unique anatomical and physiological features of the fibula, while the disastrous late results that sometimes follow the removal of the shaft of such bones as the radius and tibia make many look askance at diaphysectomy in general. Moreover, the good features of conservative treatment, so ably stressed by Starr and subsequent workers, tend to prevent one from carrying out a "radical" procedure, even when there are excellent reasons for it.

Indications for Diaphysectomy in the Treatment of Acute Osteomyelitis of Long Bones.

In 1880 Pasteur found the *Staphylococcus aureus* in pus taken from a patient suffering from acute osteomyelitis of the tibia, and subsequent work has shown that about 90% of all cases of osteomyelitis of the long bones are due to that organism. Chiefly because of the destructive action of staphylococcal toxins on blood vessels in the bone, the incidence of sequestrum formation is exceedingly high.

In a series of 337 cases recently reported by D. E. Robertson, of Toronto, the mortality rate for staphylococcal osteomyelitis was 22·5%, and of those patients who recovered, 80% developed sequestra; on the other hand, for sixty cases of streptococcal osteomyelitis the mortality rate was 13%, and no patient who recovered developed a sequestrum. It is thus evident that staphylococcal osteomyelitis is the greatest problem in treatment. After the acute phase has passed the chief hazards are the formation of sequestra, deformities due to disturbance of bone growth, lesions in other parts of the body from the persistent septic focus, and reactivation of the disease years after it has been apparently cured.

If bone always completely regenerated after removal, and the part could be kept in perfect position while this took place, complete excision of a focus would obviate these dangers.

Lepuyre and Cabanac state that Vigarous, of Montpellier, published an account of the first case of diaphysectomy in 1812. Despite this early introduction, it is only in the last twenty years that the operation has been thoroughly tested in the treatment of early cases of acute osteomyelitis. During this period many series of cases have been reported in the English, American and Continental literature, French surgeons in particular persisting with the method when others abandoned it. After studying the results, I must agree with Hamilton Bailey in a whole-hearted condemnation of the operation for all long bones other than the fibula. While patients who are not desperately ill with septicæmia stand the operation very well, the risk of the bone failing to regenerate is so great that this alone is sufficient to prevent one's advocating the method.

After diaphysectomy of the tibia amputation of the leg is sometimes necessary, while gross deformity at the wrist frequently follows a failure of regeneration of the shaft of the radius.

The fibula stands in a different category from all other long bones. I cannot find reference to a single case in which the diaphysis has failed to regenerate in a child, nor in which deformity occurred at the ankle.

In addition, the presence of a complete fibula is not essential to the perfect functioning of the leg.

Partial diaphysectomy is advocated by some. Hart favours the removal of that portion of the shaft from which the periosteum has been stripped by pus. He does not give details of the results obtained, but Bailey in one instance left the upper portion of the shaft and it later separated as a sequestrum. I cannot see any advantage over conservative surgical drainage in such a method.

The merit of complete diaphysectomy is that while being a safe surgical procedure, it rids the patient of the dangerous bony focus and ensures a short convalescence and absence of recurrence in later years.

The Operation.

As the operation is greatly facilitated by the absence of bleeding an Esmarch rubber bandage tourniquet is applied to the thigh. The incision is made along the line of the posterior margin of the fibula, extending from the neck above to the external malleolus below. The external popliteal nerve is identified and preserved as it passes underneath the deep fascia behind the neck of the fibula. The incision is deepened to the bone along the posterior intermuscular septum; the upper limit should be just below the external popliteal nerve. Usually the disease begins in the lower metaphysis, and since the cortical bone is very thin here, subperiosteal pus is almost invariably encountered. Beginning at the upper end, the surgeon separates the periosteum from the bone and retracts the two peroneal muscles forward with it. The most difficult part to separate is that of the line of attachment of the interosseous membrane and the upper portion of the interosseous ligament near the ankle. Care is taken not to interfere with the attachment of periosteum to the lower epiphyseal line.

The peronei may then be drawn backwards and the fibula divided just above the lower epiphyseal line.

The upper portion of the shaft is then grasped and by leverage it is avulsed at the upper epiphyseal line. Separation always occurs on the diaphyseal side of the cartilage. The shaft which has been removed will show at its upper extremity small pits into which the epiphyseal cartilage fitted in the intact bone.

Case Histories.

R.D., a male patient, was fourteen years of age. For two weeks prior to his admission to hospital he suffered from a number of furuncles. On March 14, 1935, he presented himself for examination, complaining of pain in the right ankle region and a feeling of general malaise. His temperature was 38·9° C. (102·2° F.) and the pulse rate 92. Tenderness was elicited over the lower metaphysis of the right fibula and some pitting œdema was present in the overlying soft tissues. There was no evidence of fluid in the ankle joint, while movement there was free and only slightly painful.

A diagnosis of acute osteomyelitis of the lower metaphysis of the right fibula was made, and the patient was admitted to hospital under the care of Dr. E. S. J. King. The operation of complete diaphysectomy of the right fibula was performed on March 15, 1935. Frank pus was found lifting the lower 12·5 centimetres (five inches) of periosteum from the shaft. Culture of this yielded *Staphylococcus aureus*. After the wound had been loosely sutured a drain tube was brought out through the lower end. Some wound infection occurred, but in four weeks' time there was very little discharge from it.

By August 1, 1935, the boy was walking well without a stick, and he was advised to begin work again.

Unfortunately, the day after being admitted to hospital he complained of a little pain in the left shoulder, and the subsequent course showed that a very chronic osteomyelitis of the upper end of the left humerus had developed.

This eventually led to the formation of a sinus on April 16, 1936, but it quickly healed and the lesion has remained quiescent.

Almost certainly the infection of the humerus occurred during the initial septicæmic phase of the osteomyelitis, but did not give sufficient pain to cause complaint until after a lesion was manifest in the fibula.

The regeneration of the diaphysis was interesting. Two months after the operation X ray examination showed evidence of good bone regeneration in the upper and lower ends of the shaft, but none was visible in the centre. Two months later the central portion was not as well ossified as the rest, although the function of the limb had long been perfect.

V.R., aged five years, complained of pain in the region of the left ankle since falling from a scooter two days before. On the day prior to her admission to hospital she frequently screamed with intense pain.

Examination showed that she was well nourished, but that there was an area of impetigo on her nose. Her temperature was 39·1° C. (102·4° F.) and the pulse rate 140. Redness and pitting œdema were evident over the lower portion of the shaft of the fibula. The bone was exquisitely tender in this situation. Ankle movement was somewhat painful, and there was slight limitation of dorsiflexion. A diagnosis of acute osteomyelitis of the lower metaphysis of the fibula was made.

On February 25, 1938, a complete diaphysectomy of the fibula was performed under general anæsthesia. Pus was found under the lower 7·5 centimetres (three inches) of periosteum. The wound was loosely closed with interrupted silkworm gut cutures, and a drain tube was brought out through the lower portion of the incision. After the application of a dressing the lower limb was encased in plaster extending from the upper one-third of the thigh to beyond the toes, a "window" later being cut over the line of the incision. Some infection of the wound occurred, but it healed in a month.

Staphylococcus aureus was grown from the pus. One month after operation there was X ray evidence of bone regeneration along the whole of the shaft. This was most pronounced in the upper third, less in the middle, and just visible in the lower third.

The child was discharged from hospital walking with the limb encased in plaster. Histological examination of the infected diaphysis revealed no evidence of medullary infection at the upper level at which the periosteum was stripped from the bone by pus.

This finding is in accord with Starr's observations in acute osteomyelitis, the pus at an early stage passing through the thin cortical bone near the epiphyseal plate and spreading rapidly under the periosteum. This is noted in practically all recorded cases of osteomyelitis of the fibula due to staphylococcal infection. On the other hand, in osteomyelitis of the lower end of the tibia extensive spreading frequently occurs in the medulla without the subperiosteal formation of pus.

In this second case further regeneration of the shaft of the fibula was seen during the next four months, the child in the meantime continuing her normal activities. The peronei functioned perfectly, and ankle movement left nothing to be desired. Six months after operation her health was still good; the scar showed no evidence of infection.

Regeneration of the shaft of the fibula differed from that seen in the first case in that, as judged by radiography, bone formation was slowest in the region of the original infection.

The centre of the shaft was last to ossify in Dr. King's case, and indeed regeneration was much slower than in mine. This could be explained by the different ages of the patients.

Summary.

1. Complete diaphysectomy is advocated as the ideal treatment for acute staphylococcal osteomyelitis of the fibula.

2. Except for one case, in which the external popliteal nerve was divided, no bad results from this method have been found in the extensive literature.

3. Two cases successfully treated by diaphysectomy are reported.

Acknowledgement.

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FŒTUS AMORPHUS.[1]

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THE problem of orientation presented the immediate difficulty in an examination of a *fœtus amorphus*. Clinical data might have been of assistance, but no notes accompanied the specimen, which had been lodged at the Department of Anatomy, University of Sydney, in 1929.

Tentative reliance was placed on the following observations in an attempt to determine the cranial and caudal ends and the ventral and dorsal surfaces. In one area the hair and texture of the integument suggested scalp; the margins of a cleft were lined by mucous membrane, and the position of a flattened tube, in which a vein could be seen, was suggestive of an umbilical cord. A radiograph provided vague evidence of the presence of teeth and of a shapeless mass of bone. When the fœtus was considered in conjunction with the observations recorded above, it was permissible to assign to it arbitrarily the designations used in the following description.

The fœtus weighs 585 grammes and its maximum length and width are 14·0 centimetres and 12·9 centimetres respectively. It consists of three distinct masses, which have a common point of fusion. The largest mass is pyriform and constitutes roughly four-fifths of the whole. The lower of the two smaller masses is heart-shaped and is approximately one-third greater in size than the smallest of the three, which is shaped like a spleen. The dimensions of the three in centimetres are: 14·0 by 9·8, 6·5 by 5·0, and 5·0 by 3·2.

External Appearances.

Ventral Aspect.—The cranial end is slightly less wide than the caudal end. The upper (and smaller) of the two dependent masses obscures practically the whole of the cleft (which resembles a "hare lip") and projects over the upper margins of the heart-shaped mass. At the intersection of the periphery of these two masses on the right side is a bidigital appendage. This is attached in equal measure to these masses and is continuous with the main fœtal mass. The appendage is capped with mucous membrane similar to that on the "hare lip". On the superior margin of the appendage there is a groove, in which passes, to be deeply inserted, the remnant of the "umbilical" cord.

The cleft to which reference has been made is irregularly triangular, with the basal arm prolonged downward on one side and sidewards on the other. It is lined by mucous membrane, and where this effects a union with the integument, a typical mucocutaneous junction can be seen. Near the entrance of the cleft is a lump of semi-cartilaginous material. A deep fissure, at the junction of the middle and lower thirds of the main mass, emerges on the right side of the mass, intermediate in size, and can be traced on to the dorsal surface, where its course is obliquely downward. Its entity is lost near the caudal extremity. The fissure, which is occupied by hair, divides the skin on this side into two areas of different texture, the lower being hairless, paler and thinner. A much shorter and more superficial fissure on the left side is separated from its fellow by a flattened hairy fossa, 2·7 centimetres broad; dorsally these fissures fail to meet by 4·2 centimetres.

Broadly, the main fœtal mass is subdivided into an upper solid and a lower cystic portion. At the inferior margin of the latter there is a patch, elongated in the long axis, of whitish scar tissue. This is condensed in some areas at the edges into thick folds. The arrangement of these around an eccentrically placed sulcus suggests a proctodæum. Superior to this the white scar tissue broadens into an oval area, then narrows finally to a point, above

[1] This work was carried out under a grant from the National Health and Medical Research Council at the Department of Pathology, University of Sydney.

which there is a deep crease in the skin. Here the integument is thicker, but smoother, and is disposed in such a way as to simulate a genital cleft. This disappears in the equatorial fissure described above.

Right Lateral Aspect.—The upper solid portion has hair on its right lateral aspect, the hair covering three-quarters of this surface. A number of small cysts are present on the antero-lateral surface at the cranial end, and adjacent to them are two pits.

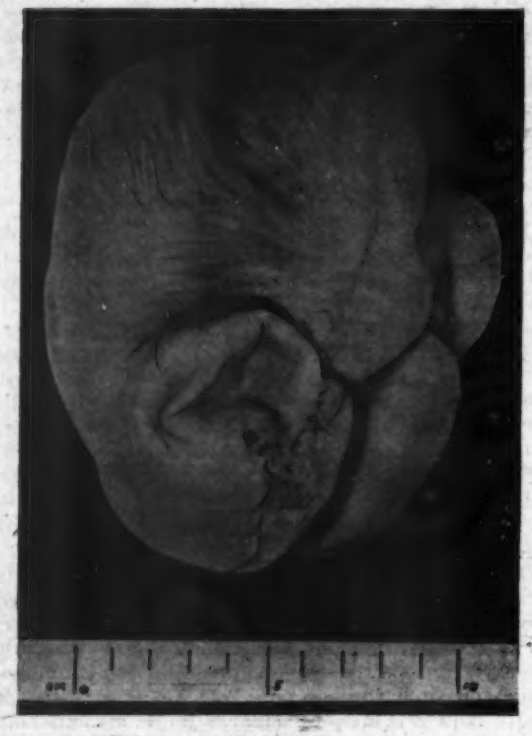

Figure I.
The *fœtus amorphus* from the right side.

Left Lateral Aspect.—Superiorly there is a funnelled depression lined by a rough, dirty-white, thick tissue. Apparently continuous with the "hare lip" on the left side is a sulcus. Before it dives into a triangular pit it runs laterally for 1·1 centimetres. The inferior arm of the pit is bounded by an oval vesicle, which obscures the subjacent pit. The vesicle is 1·5 centimetres long, is covered by a whitish tissue, and is joined to a larger vesicle, 3·2 centimetres in length. The skin over this is pink. From beneath the inferior margin of the vesicles a tuft of hair springs; and caudal to them are two small cystic swellings. A tag of tissue juts horizontally from the base of the point of conjunction of the three principal masses.

Dorsal Aspect.—The dorsal surface is devoid of hair. The only features are a large pore in the mid-line and a horizontal sulcus at the level of the equator of the fœtus on the left side.

Internal Structure.

The two smaller masses were incised and firm greyish tissue of the appearance and consistency of uncooked fish flesh was disclosed. No other structures were present. The cavity sheltered by the "hare lip" admitted a probe to a depth of 2·1 centimetres, while the triangular pit on the left lateral surface was found to be 2·5 centimetres deep. A communication between the two cavities was demonstrated. The ceiling of the first cavity

Figure II.
The left side of the *fœtus amorphus*.

was a flattened plate of cartilage, 1·0 centimetre thick, which also gained attachment to the side walls. A bilobed bar of cartilage constituted the floor; superior to it was a fringed tube of tissue; inferiorly the "umbilical" cord was disposed. The irregular bony mass, which had been detected radiographically (Figure III) was found to have the following relations. Anteriorly it was intimately connected with the cartilaginous bars; posteriorly there was a collection of fat lobules, which in turn was associated with the pore on the dorsum of the specimen; laterally (left side) there was white myxomatous tissue which formed the base for the vesicles on the surface; laterally (right side) there was myxomatous tissue.

Fluid smelling strongly of formalin escaped when a dorsal incision was made into the cystic end of the fœtus. The cyst was found to be lined by a smooth serous membrane. At the superior margin

of the chamber of the cyst there was a multilobular lump about the size of a walnut (4·0 centimetres). The lump was invested by a fine translucent membrane, and enmeshed in its folds were thin cords. The thicker of these were inserted by fibrillary attachments to the area corresponding on the outside with the puckering resembling a proctodæum. That which had had the external appearance of a genital cleft proved to be merely a fold of the wall.

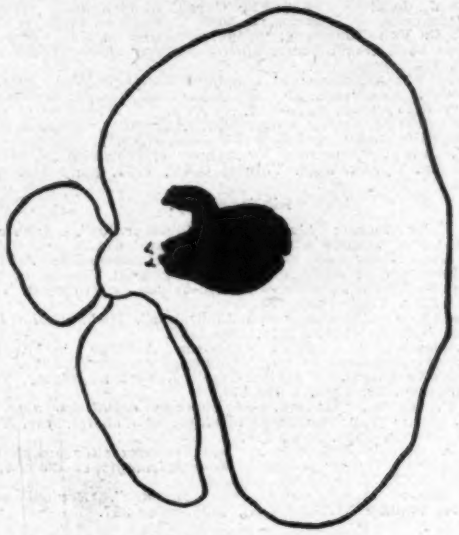

FIGURE III.
A *camera lucida* drawing of the radiograph. The dense irregular area represents the position of the irregular piece of bone.

When the membrane was stripped off the multilobular lump the yellowish lobules were found to vary in size. A band, which had commenced its course from the caudal end of the fœtus, was lying in a groove on the anterior surface of the lump. The band was accompanied by a leash of "vessels", arising from the superior border of the lump, and disappeared cranially through a firm circular ring, finally being attached to the bony mass. No organs were found.

Microscopic Appearances.

A piece of tissue from the centre of the spleniform mass consisted of a loosely reticulated tissue resembling Wharton's jelly, and some very small blood vessels. One of the tags, which corresponded in position with an umbilical cord, was partially covered by a thin layer of squamous epithelium, beneath which were two large vessels containing blood. The other tag had squamous epithelium on one side and a large vessel with a thickened wall. Another and larger vessel-like structure was incomplete and had a calcareous plaque incorporated in its wall. Bone was demonstrated in two sections, while the connective tissue was arranged in such a way, in two other sections, as to suggest lobules of adipose tissue from which fat had been dissolved. Striated muscle, in both transverse and longitudinal sections, was seen in association with the lobules, and with what looked like lymphatic channels. Nervous tissues were revealed in several preparations, and neurones, neuroglia, ependyma and structures resembling the chorioid plexus were found. A section from the margin of the "hare lip" supported the original premise, because it showed typical lip, with squamous epithelium on one surface and mucous glands subjacent, the other surface revealing skin epithelium and pilo-sebaceous follicles.

The Literature.

Simonds and Gowen,[1] in presenting the details of a *fœtus amorphus*, extensively reviewed the literature up to 1925. They were able to compile a list of 45 previous examples in man, 12 in cattle, three in a goat and sheep, and one in a bird.

Since 1925, 13 cases in man and one in a cow have been listed in the *"Index Medicus"*. An investigation of the recorded details of some of these permits a number to be placed in the category of *acephalus* and *mylacephalus*. The following six cases appear to correspond with the classical description of *fœtus amorphus*; however, not all of the records were available for inspection.

Case I is described by Beerens.[2]

The mother was a *primipara*, aged nineteen years. After the birth of a normal female infant the *fœtus amorphus* was born. No form or organs were recognizable. There were traces of an umbilical cord, hair, and a small orifice thought to be buccal. A radiograph revealed vertebral column and other unspecified parts of the skeleton.

Case II was described by de Gues.[3]

The specimen is a shapeless lump. Radiologically no bones could be seen within it. No dissection was done.

Case III was described by Van Tongeren.[4]

The mother was a *multipara*, aged twenty-nine years. Her previous children were normal. A shapeless mass, with the consistence of a somewhat softened myoma, was felt *per vaginam* after the birth of a normal infant. A cleft was felt in the amorphous twin. The first attempt to extract the monster failed; it was then seized with instruments, but portion was torn away. Next a track was driven through it; fluid escaped, and the monster was delivered by a cranioclast. Hair, skin and bones were recognized. The placenta was that of uniovular twins, and the thinner of the two umbilical cords arose from the smaller cavity. Anastomoses were in the placenta and not in the cord. A radiograph revealed cranium, vertebræ and pelvic bones. There was an abnormal number of cervical vertebræ and humerus (?) or clavicle.

Case IV was described by Schultze.[5]

Attached to the placenta of a full-term child was a small egg-shaped tumour measuring 65 by 38 by 52 millimetres and weighing 75 grammes. An artery

formed a connexion between the tumour and the umbilical artery of the normal child. The tumour lay in a separate pocket of the amniotic membrane, and showed an umbilicus, tuft of hair, nose, a cerebral vesicle, nervous tissue, apparently a rudimentary spinal cord, striated muscles and bones. The mother was a *primipara*, and the parents came from two different "twin families".

Case V is described by Schmid.[6]

The monster was like a tumour in appearance, and kidney shaped. There were no limbs or indication of the cranial end. The weight was 40 grammes, and the measurements 3·7 by 3·8 by 1·9 centimetres. No organs were found, but hair, cartilage, *"Anlagen"* of striped muscle, fat, and well vascularized connective tissue were present. An X ray examination revealed what were thought to be vertebræ with a pelvic girdle at the lower end. Incidentally the "vertebræ" contained no *"Anlagen"* of the central nervous system. The umbilical cord incorporated an artery and a vein and a small duct (urachus).

Case VI is described by Ruge.[7]

The mother was a *multipara*, aged forty-two years. A fœtus was found to be presenting in the right occipito-anterior position, and a bluish-red body, the size of a small fist, hung by a cord-like structure from the vagina. The cord was torn and the central end was ligated. The normal fœtus, a male, was born spontaneously. From the point of the insertion of the umbilical cord into the placenta a vein coursed into the amnion for fifteen centimetres, and then, accompanied by a fine vessel, thought to be an artery, disappeared into the thin cord of the tumour. Histologically, skin, hair papillæ and sweat glands were found in addition to bone. Small ganglia cells, distorted *"Anlagen"* of the central nervous system, were seen to be lying in cavities of the bone.

To these six cases is added the specimen reported in this contribution, a total of 53 examples of *fœtus amorphus* in the literature.

The sizes vary from 4·5 to 40·0 centimetres, and the lowest and highest weights range between 40 and 2,020 grammes.

In an analysis of the organs which have been found to be present, skin, hair, bone, striped muscle, brain and intestine predominate. Unrepresented tissues comprise: pituitary, thyreoid, parathyreoid, thymus, ovary and spleen. Simonds and Gowen[1] quote Schwalbe as stating that the development of the head end "rarely predominates"; but it is thought that this statement refers to *fœtus acormus*. They expressed the opinion that only six cases, at that time, could be included in this category. It is true that their own specimen exhibited development of the head end, but not to the degree which distinguishes the very rare acormi. The specimen described in this paper satisfies the less critical requirement by the presence of brain and lip tissues, which incidentally dispose of the issues involved in the problem of orientation.

Acknowledgements.

I wish to thank Professor W. K. Inglis, whose views on the microscopic appearances are in agreement with those expressed above. Mr. Woodward Smith is responsible for the excellent photographs.

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SEPTIC ARTHRITIS OF THE KNEE JOINT.[1]

By H. A. Sweetapple,
Sydney.

It seems that septic arthritis of the knee joint is a very rare disease, for in the past seven years only five patients have been admitted to the Royal Prince Alfred Hospital suffering from this complaint; and this is a hospital of 500 beds, which admits 10,000 in-patients every year. In only two of these five cases was the arthritis due to perforating wounds; in one it followed a fall on the knee a few days before the patient's admission to hospital, in one there was a history of subacute pain and swelling in the knee for some months, and in one the patient was a man, aged thirty-three years, who gave a history of indeterminate trouble in the knee since the age of eight years.

It will be seen, therefore, that my own experience in civil practice cannot be very extensive, though it happens that in the past twelve months I have seen four patients whose septic arthritis followed operations on the knee joint in hospitals outside Sydney, and another, in another hospital whose lesion was due to gonorrhœa.

[1] Read at the annual meeting of the Australian Orthopædic Association (British Medical Association) in March, 1938.

ILLUSTRATIONS TO THE ARTICLE BY DR. OLIVER LATHAM.

FIGURE Ia.

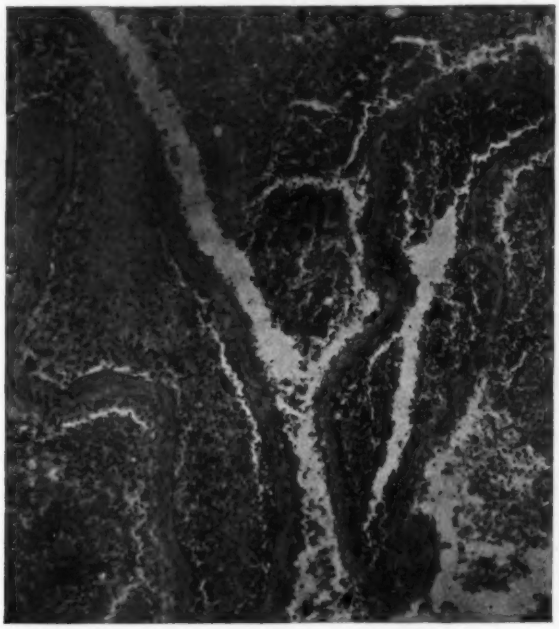

FIGURE Ib.

Photomicrograph of portion of the lesion, showing two of the angiomatous vessels and accompanying hæmatomyelia. (×100.)

FIGURE Ia.

Photo of museum specimen, Case I, showing cross and longitudinal sections of the intracordal vascular tumour and hæmatomyelia. Notice tendency to track along posterior horns.

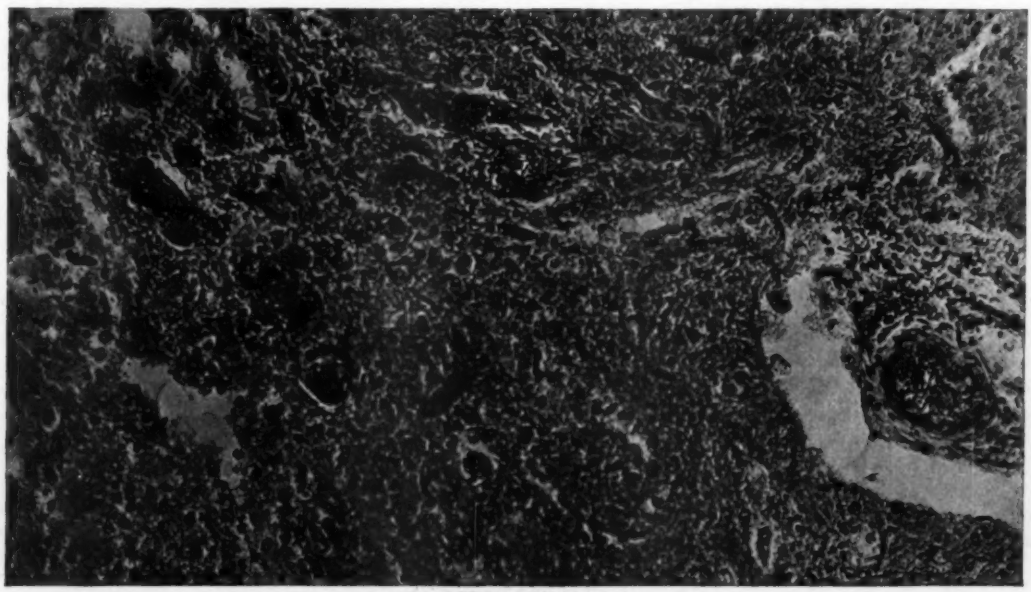

FIGURE III.

Photomicrograph of part of the area of gummatous reaction in a cross-section of the spinal cord in Case IV. The whole area is hæmorrhagic and the seat of many softenings. (×100.)

ILLUSTRATIONS TO THE ARTICLE BY DR. W. E. HARRISON.

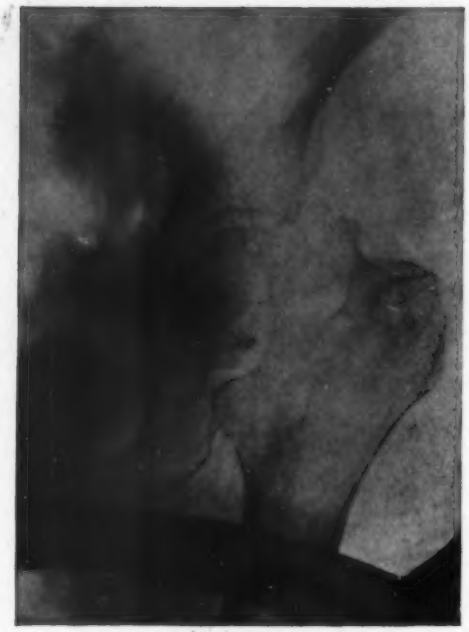

FIGURE I.
Subcapital fracture of the neck of the femur five weeks after the injury: antero-posterior view.

FIGURE III.
Guide wires introduced: antero-posterior view.

FIGURE II.
Fracture reduced, with caliper in position: antero-posterior view.

FIGURE V.
Nail in position: antero-posterior view.

FIGURE VI.
Nail in position: lateral view.

ILLUSTRATION TO THE ARTICLE BY DR. W. E. HARRISON.

FIGURE IV.
Guide wires introduced: lateral view.

ILLUSTRATIONS TO THE ARTICLE BY DR. NORMAN M. HARRY.

FIGURE I.
Case I. Antero-posterior view, showing regenerating fibula six weeks after diaphysectomy.

FIGURE II.
Lateral view, showing regenerating fibula six weeks after diaphysectomy.

FIGURE III.
Antero-posterior view of regenerating fibula twelve weeks after diaphysectomy.

FIGURE IV.
Lateral view of regenerating fibula twelve weeks after operation.

FIGURE V.
Antero-posterior view of regenerating fibula eighteen weeks after operation.

ILLUSTRATIONS TO THE ARTICLE BY DR. REGINALD WEBSTER.

FIGURE XXXI.

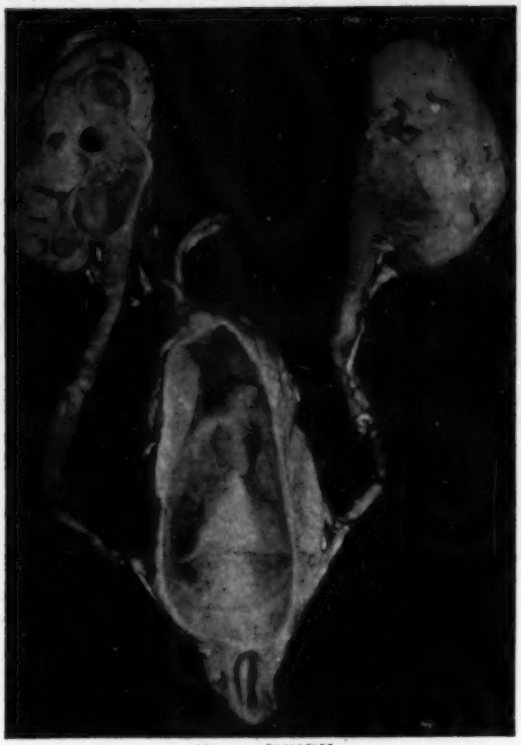

FIGURE XXXIV.

FIGURE XXXII.

FIGURE XXXIII.

Ætiology.

The organisms responsible are usually the staphylococcus, streptococcus or gonococcus, and their mode of access is by a perforating wound, by the blood stream, or by direct spread from an adjacent bony focus. This last-mentioned method of attack is uncommon; for the site of election for osteomyelitis is the metaphysis, the epiphyseal cartilage is usually an effective barrier, the age for osteomyelitis is childhood, and the metaphyses of the femur and tibia are extraarticular. With the exception of those caused in the operating theatre, perforating wounds, may occur at any age.

Morbid Anatomy.

The gross morbid changes vary from case to case; but the microscopic changes are constantly those of septic inflammation seen in any situation. The synovial membrane is congested, the capillary vessels are dilated, and the tissue spaces are distended by fluid effusion. Simultaneously there is an outpouring of synovial fluid, which contains polymorphonuclear leucocytes and representatives of the infecting organism. If these are scanty and mostly extracellular, the infection is likely to be mild. A fact about the synovial fluid which seems to be agreed upon is that, like effusions in the other serous cavities, it is strongly antibacterial while fresh, but excellent pabulum for bacteria when stale. General surgeons have learned to trust in the antiseptic properties of the peritoneum; we are probably too chary of trusting the synovial membranes.

Macroscopically, the knee is usually found to be distended by excess synovial fluid, which may appear normal or turbid, or may have the appearance of frank pus. If purulent, it may be thin and watery, or so thick and viscous that aspiration or syringing is difficult, and in either event the fluid may or may not contain loose bodies. The loose bodies will consist either of pieces of articular cartilage or of portions of coagulated fibrin.

The synovial membrane in the typical case is three or four times its usual thickness from congestion and œdema. It is dark red in colour, and the villi are enlarged and easily visible to the naked eye as a granular or velvety plum-coloured surface. It shows a tendency to enlarge its territories by creeping over the margins of the articular cartilage in irregular pannus formation, and by its diffuse swelling it bulges into the interstices of the joint, filling them.

The articular cartilage loses its typical glossy appearance in irregular patches where friction occurs. Flakes of cartilage become detached from the subjacent bone, an irregular geographic pattern being left, and they float about in the effusion.

At later stages, first the fibrous capsule, then the surrounding muscles tendons and ligaments, become swollen, softened and stretched. The purulent effusion erodes or bursts the confines of the capsule, usually through the posterior ligament, which is the weakest part, and abscesses form in the intermuscular planes. These may travel long distances, if the patient lives long enough, before presenting under the skin of the calf or lower part of the thigh.

A description of the morbid anatomy is not complete without mention of the gross deformities of the limb which may occur. The commonest are flexion deformity, *genu recurvatum*, and backward subluxation of the head of the tibia. They are encouraged to form by softening of the ligaments and by muscle spasm, but can be prevented by proper splinting, and should never occur.

While this description is typical of severe septic arthritis of the knee, there are many variants or grades merging one into the next.

In the mildest type, nothing more than slightly turbid synovial effusion and slight thickening of the synovial membrane occur before the process regresses. In others, there is no demonstrable excess of synovial fluid, but a general thickening and hardening of the capsule, while erosion of the joint surfaces slowly proceeds. In the patient who recovers, the joint may be nearly normal, or dense bands of scar tissue may unite the patella, femur and tibia like strong but uninvited intraarticular ligaments; or there may be marginal bony proliferation, as in the severer grades of osteoarthritis, or actual bony ankylosis.

Treatment.

In discussing the treatment, I propose for clarity to distinguish between the following types: (i) the mild, not frankly suppurating lesion; (ii) the purulent joint, or empyema; and (iii) lesions due to perforating wounds.

Treatment of all types has two common features, namely, the employment of general measures to conserve the patient's resistance, and the prevention and correction of deformity. I shall not discuss the general measures; and as to the deformities, I shall allot a separate section to them later on.

In the mild or chronic non-suppurating lesion the first guiding principle is rest. To rest the joint, there is probably nothing so good as the Thomas bed knee splint, applied with fixed skin traction and with attention to all the minutiæ of its proper use. This gives dramatic relief from pain; and the patient who has previously dreaded examination, has resented even traffic past his bed, has shrieked when the limb was roughly handled, becomes docile and grateful. There are other methods of immobilization, such as a plaster of Paris or a back splint; but they lack the very important effect of keeping the joint surfaces apart. It is the friction of the inflamed joint surfaces that causes the distressing night starts and undermines the victim's resistance.

If there is no demonstrable effusion—and this is not uncommon—there is nothing else to be done. There is nothing to aspirate and nothing to drain. These lesions are painful, early movement is

impossible and harmful, and ankylosis either by dense fibrous adhesions or by bone is the expected outcome. The prognosis for movement is apt to be worse than in the cases in which effusion is present.

If effusion is present, however, it should be evacuated. An exploratory syringe is used and the joint is emptied. Another needle of fairly wide calibre is inserted into the other side of the joint, and warm saline solution is gently syringed through. Sometimes one such syringing turns the tide; the temperature falls, general improvement is manifested, and the joint is not refilled with fluid. In other cases the effusion reappears in twenty-four or forty-eight hours, and the process should be repeated. At the second irrigation the aspirated fluid may be found to be less turbid, culture may produce fewer colonies, and a hopeful prognosis may be given, at any rate for the subsidence of infection, and probably as to the mobility of the joint.

In the lesion which is purulent when first seen, or which does not respond favourably to aspiration and irrigation, there is room for difference of opinion, because it appears that at times excellent results follow at least three different methods of treatment.

The first is Everidge's modification of Willem's treatment. Everidge used bilateral incisions running transversely backwards from the junction of the upper and middle thirds of the patella for 3·75 centimetres (an inch and a half). He found that these incisions remained patent better than the usual vertical incisions; and to ensure patency, he sutured the cut edges of the synovial membrane to the skin and inserted a strip of rubber tissue in each incision to prevent closure by adhering blood clot. Active movement he insisted upon from the beginning. He facilitated this by fixing the limb to a hinged back splint, each half of which was separately supported by counter weights. This allowed the patient to flex and extend the knee with a minimum of expenditure of his depleted energies, especially as the distal end of the splint bore a pair of small wheels to run smoothly on an inclined plane. The hinge of the splint could be fixed in any position by a detachable turnbuckle placed posteriorly as in the McIntyre splint. This was used to fix the splint at night and between periods of exercise. In 23 cases he achieved useful mobility in 11, in 11 others ankylosis occurred.

This method has been adversely criticized by writers who were unable to duplicate Everidge's results, and in particular it is frequently stated that early movement is too painful for an ordinary person to tolerate. Everidge, however, says that the men used to ask that the turnbuckle be removed whenever increasing pain indicated accumulation of pus. Active movement of the knee evacuated the pus and relieved the pain.

At the other end of the scale from Everidge's treatment is a method described by F. J. Cotton, of Boston. He advocates closure of the joint and immobilization in plaster, after irrigation, or washing of the synovial cavity. This washing is carried out through two parapatellar longitudinal incisions, normal saline solution being used at a temperature of 43° C. (110° F.) for thirty minutes. The plaster is not removed unless the patient's constitutional state deteriorates. If, however, the temperature remains elevated and the pulse rapid, the knee is inspected, and the same procedure is repeated if inspection reveals much effusion. Active movement is commenced as soon as the acute symptoms subside, for example, in ten days.

A third method of treatment is by drainage, traction, and temporary immobilization. Drainage is achieved by anterior, or combined anterior and posterior arthrotomy. Traction is abandoned as soon as the joint settles down. This, according to H. O. Clarke, is the plan practised at the Ancoats Hospital. At first active movement used to be encouraged at this stage; but now the limb is fixed in a walking caliper for three or four weeks, and the patient is encouraged to walk. Clarke states that this innovation does not lead to more stiffness, and that in those cases in which bony ankylosis is inevitable this end is achieved sooner. In thirteen cases in which this treatment was carried out there were two deaths; ankylosis occurred in four, and in seven full or partial movement was retained.

It seems, therefore, that of these three methods of treating empyema of the knee joint which does not respond to aspiration, none stands out as strikingly superior to the others, that the principles of trust in the bactericidal properties of the synovial membrane, of removal of the effusion when excessive, and of avoiding too long immobilization of the joint, are sound, and that there is scope for variations in practice according to one's personal preferences.

The next type of case is that in which the infection is due to perforating wounds. Here I need only discuss the prophylactic measures intended to prevent infection; for if infection becomes established, the lesion falls into the previous group.

It is first necessary to know if a given wound in the region of the knee does perforate the joint. This may be easy if characteristic synovial fluid is exuding; but if it is not, a useful test is the injection of five cubic centimetres of ether into a remote part of the joint. The body temperature will cause the ether to vaporize, the outlines of the synovial pouches will become obvious, and if a communication with the exterior exists, ether vapour will escape. Incidentally, McMurray advocates the injection of ether into a septic joint in the early stages as a therapeutic measure. He says that he has repeatedly used this procedure, and is convinced of its value.

If a wound does penetrate the joint, then the now well-recognized principles of wound *débridement* and closure, if applied early, give good results. It

is not possible to speak with authority on perforating wounds, however, because in civil life they seldom cause sepsis.

Treatment of Complications.

It remains to mention the treatment of complications. These are deformity, stiffness and pain.

Deformity can easily be prevented if the limb is kept in extension, with adequate support behind the head of the tibia. I do not think that splinting in extension to prevent deformity is incompatible with early movement, for in Everidge's method the splint is fixed at night in extension, and in the other methods immobilization is practised only in the early stages. After the acute stage, ability to extend fully must be insisted upon at least once daily, or splinting must be resumed.

For the established deformity, osteotomy is required if the ankylosis is bony. For flexion deformity, removal of a wedge of bone from the front of the lower end of the femur is probably safer than a linear osteotomy, because of the traction the latter imposes on the popliteal vessels and nerves.

If the deformity is due to fibrous ankylosis, it can be corrected on a straight Thomas splint if the deformity does not exceed 30° or 40°. If it is in excess of this, backward subluxation of the tibial head must be guarded against. It is a pity that the merits of the "two-way" Thomas splint are not more widely known, because it is exceedingly effective.

Stiffness is due to adhesions; and whatever may be one's views on the manipulation of ordinary adhesions, those following septic arthritis must be treated with respect. In the first place, if the patella is fixed or possessed of very little movement, manipulation is out of the question. In the second place, a stiff, painless joint is better than a painful movable one, and if the configuration of the damaged joint surfaces is such that movement is bound to be painful, then do not manipulate. Finally, there is the ever-present risk of lighting up the inflammatory process by injudicious force. Even in view of these warnings, there are cases in which improvement can be attained by manipulation; but the response to increasingly forceful active movement must be estimated as a guide to the probable effects of passive or forced movements.

Pain occurs only if movement is present. It may rarely be relieved by increase of the range of movement; but the problem is that of the painful osteoarthritic knee, *plus* the risk of the lighting up of infection. Arthrodesis in the optimal position is the aim; but in the only case in which I have performed the operation sepsis followed, though the antecedent inflammation was thirty years old. Bony ankylosis ultimately occurred; but for a month after the operation I feared for the patient's life.

In those cases in which operation is contraindicated a walking caliper serves admirably and will be used in probably the greater number.

A NOTE ON THE OCCURRENCE OF FATAL PSITTACOSIS IN PARROTS LIVING IN THE WILD STATE.[1]

By F. M. Burnet.
From the Walter and Eliza Hall Institute, Melbourne.

It is now well known that Australian parrots and cockatoos caught in the wild are frequently infected with psittacosis virus (Meyer and Eddie,[1] Burnet,[2] Tremain[3]). As a rule infected birds show no obvious symptoms, and the fact of infection can be established only by *post mortem* examination and inoculation of spleen and kidney into mice. Particularly with infected cockatoos the infection is liable to flare up into activity if the newly caught birds are kept under unhygienic conditions. In the outbreak investigated by Burnet and Macnamara[4] a consignment of sulphur crested cockatoos developed severe psittacosis some weeks after being caught. Many of them died, and those of the remainder which were killed and examined showed gross and typical lesions. Several human infections, at least three of which were severe, were traced to these cockatoos.

I had been told that on occasion sick and dead parrots might be noticed in the bush, but no opportunity for the investigation of such an occurrence has arisen until this year. That I have received information of three outbreaks of fatal disease in wild parrots from reliable and interested observers is possibly an indication that psittacosis in wild parrots has recently been more active than usual; in each of these three cases it has been possible to examine a recently dead bird and to establish psittacosis as the cause of death.

I am indebted to Mr. David Fleay for information about the disease in King parrots (*Aprosmictus scapularis*) in hilly timbered country near Healesville, Victoria. Attention was first drawn to the possibility by the death in captivity from psittacosis of one or two birds of this species which had been caught in the district. This was in May, 1938, and at that time Mr. Fleay stated that he had seen an occasional dead King parrot in the bush. These deaths continued to occur during June and July, and in addition to King parrots, two crimson rosellas (*Platycercus elegans*) were seen dead in the bush. On July 18 he was able to send me a bird which had been seen to fall from a tree and was picked up dead. This was a King parrot in adult male plumage. *Post mortem* examination revealed the classical signs of acute fatal psittacosis, including numerous petechial hæmorrhages in the skin, an appearance I have previously seen only in a dead galah (*Kakatoë roseicapilla*). Direct smears of spleen substance and pericardial exudate were stained by Castaneda's method and showed

[1] This work was carried out under grants for research on virus diseases from the Rockefeller Foundation and from the National Health and Medical Research Council.

numerous L.C.L. bodies, and mice inoculated with spleen emulsion developed the characteristic experimental disease.

The second occurrence in rosellas (*Platycercus eximius*) was reported to me from near Launceston, Tasmania, by Mr. J. A. Dumaresq, Veterinary Pathologist of the Tasmanian Agricultural Department. He had observed occasional sick rosellas on the farm in question and forwarded to me on October 31, 1938, one which had recently died. This bird showed the typical signs of psittacosis with L.C.L. bodies present in enormous numbers in smears from the inflamed abdominal air sac membranes. Incubation of an inoculated culture tube yielded no bacterial growths, and inoculated mice died in five to ten days with typical lesions. Mr. Dumaresq notes that "dead parrots have been found on the property for many years, but never in large numbers, and most commonly they have been Rosellas in the moulting stage". This seems to suggest that an unusually virulent strain is enzootic in this part of Tasmania. It should be mentioned, however, that two batches of fifteen *Platycercus caledonicus* and nine *Platycercus eximius* from Tasmania were examined in August, 1938, with completely negative results, so that the infected regions are evidently only of limited extent.

An even more striking mortality amongst wild parrots occurred during October and November in the south-eastern district of South Australia. Hundreds of dead parrots were observed, and the epizootic was commented on by the daily Press at the time. I am indebted to Professor E. Weston Hurst for the following information received by him from a correspondent at Tarpeena, South Australia, and dated November 1, 1938:

> The matter concerns the large number of wild parrots of this district which have been dying during the past month. Literally hundreds have dropped, and are lying about in paddocks, found caught up in trees, etc. Other birds are not affected, so it seems there is some disease, possibly the Parrot disease, which is affecting them.

Later, a dead bird which had been seen to fall from a gum tree in the school ground at Tarpeena was sent to Professor Hurst, and from it he was able to isolate psittacosis virus by mouse inoculation.

The evidence that psittacosis is at times a fatal disease of wild parrots brings it into line with most other enzootic diseases which have been sufficiently investigated. In general, parrot psittacosis is an extremely benign disease, producing no apparent disability, but like every other infective disease it is evidently liable to exacerbations in severity either by a change in the virulence of the micro-organism or by changes in the circumstances of the host species. It is the general rule that enzootic diseases in wild animals become actively lethal only during the phases of over-population, which occur with considerable regularity in many species, particularly of rodents. Unfortunately I have no information as to whether any such cycle of population density can be observed in Australian parrots.

There is no evidence as to whether an increase in the virulence of psittacosis virus for parrots is associated with a parallel increase in virulence for man. It seems likely that the amount of virus inhaled is of more importance than its virulence in causing human infection, and as much more virus is liberated by a sick bird than by one with only latent infection, one might reasonably predict that an increased virulence for parrots would be associated with a greater likelihood that human infections would occur amongst those in contact with the birds. The occurrence of deaths from psittacosis amongst wild birds is at least to be taken as another warning of the potential danger to human health of the trade in parrots and cockatoos, and provides a strong argument for its total prohibition.

Summary.

Outbreaks of fatal psittacosis in wild parrots have been observed amongst King parrots in Victoria and rosellas in Tasmania, and a highly fatal epizootic amongst parrots in the south-eastern district of South Australia is recorded. In each case the diagnosis was established by isolation of the virus from dead birds.

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Reports of Cases.

PATHOLOGICAL REPORTS FROM THE CHILDREN'S HOSPITAL, MELBOURNE.

By Reginald Webster, M.D., D.Sc., F.R.A.C.P.,
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XVIII. Renal Rickets.

Renal dwarfism, renal infantilism and renal rickets are clinical terms which all connote the same pathological process; but as in individual instances one may designate the predominant clinical aspect better than either of the other two, all three remain in current usage. The child who is to bear posthumously the main burden of the ensuing discussion was notably rhachitic; hence the title, "Renal Rickets".

Clinical Record.

Lyle C., a male infant, aged eighteen months, was admitted to the Children's Hospital, Melbourne, on December 7, 1934. He was a pallid, under-nourished baby, with a yellowish tinge in his skin, and extremely flabby

and atonic muscles. His "pigeon-chest" deformity and prominent "rosary" (Figure XXXI) would have arrested the attention of the most casual clinical observer. Epiphyseal enlargement was very conspicuous in the wrists, less striking in the ankles. The anterior fontanelle was widely open, but there was no separation of the cranial sutures, and no "bossing" of the skull bones.

A biochemical investigation, carried out by Miss M. E. Green, determined the blood urea level as 155 milligrammes per 100 cubic centimetres, the serum calcium content as 7·9 milligrammes, and the plasma phosphorus content as 6·2 milligrammes per 100 cubic centimetres respectively.

I am indebted to Dr. Colin Macdonald for the following radiological report relating to this infant:

> The appearances are those of advanced renal rickets.
>
> The osteochondral junctions of all the long bones show abnormal appearances, such being most prominent in both hips, the left knee and the right wrist. The metaphyses are increased in width, but are not cup-shaped, as in florid nutritional rickets: their ossific structure shows an irregularly moth-eaten, stippled or woolly appearance. The epiphyseal lines are irregular; though the epiphyses themselves are regular in outline, decalcification of their internal architecture has resulted in the cortices being more sharply etched than usual. This appearance is akin to the Wimberger ring seen in infantile scurvy.
>
> There is noteworthy delay in the appearance of the ossific centres for the epiphyses, for, though the child is eighteen months of age, no ossific nuclei are seen for either the femoral heads or the lower ends of the radii. All the long bones show a slight degree of bowing. The bones of the calvarium show a stippled appearance, with delay in ossification at the edges of the widely open fontanelles.
>
> In 1927 Parsons[(1)] classified three groups of renal rickets on the basis of the radiographic features: (i) the atrophic; (ii) the florid, and (iii) the honeycombed, stippled or woolly type. This child falls into the third group.
>
> In this advanced form the radiographic appearances bear little resemblance to those of nutritional rickets, scurvy or congenital syphilis, all of which produce characteristic changes at the osteochondral junctions.
>
> As is common in this condition, all the bones in this instance are not equally affected; the left wrist and both ankle joints are little outside the limits of normality.

Illustrative radiograms, kindly selected for me by Dr. Macdonald, are reproduced in Figures XXXII and XXXIII.

The child lived for only twelve days after his admission to hospital, the immediate cause of death being diffuse bronchitis and bronchopneumonia.

Pathological Considerations.

The autopsy was performed by Dr. Ian Wood, to whom I am obliged for the preparation of the specimen illustrated in Figure XXXIV, as also for the photograph which furnished Figure XXXI. Reference to Figure XXXIV shows a condition of extreme dilatation of the bladder, dilatation of both ureters, and bilateral hydronephrosis. The constrictions that appear in the distal portions of both ureters in the photograph are artificial; at these points the ureters were broken at the sites of openings made for the passage of probes through the vesico-ureteral orifices. The narrowing is the result of an attempt to repair the damaged specimen for purposes of museum mounting. I would draw particular attention to the very dilated posterior portion of the urethra and the presence therein of what appears to be a hypertrophied verumontanum.

At the autopsy Dr. Wood determined that the mesial ridge in the prostatic part of the urethra divided at its distal extremity into two very thin membranous folds, which were attached to the lateral walls of the urethra on either side. The dilated condition of the posterior part of the urethra and the deep recesses on either side of the mesial ridge afford presumptive evidence of an obstruction to the urinary outflow situated at the distal extremity of the structure. It is difficult to believe that this is not an hypertrophied verumontanum. The bifurcation at the distal end of the ridge cannot be distinguished in the photograph; the cusps of the valve so formed, concave towards the bladder, were extremely thin, and a further factor operating against their demonstration in the photograph is the shrinkage which they have undergone in the process of preservation of the specimen. In the examination of the fresh specimen Dr. Wood and I were satisfied as to the existence of a valvular obstruction in the posterior part of the urethra. A valve formed in the manner indicated would offer no obstruction to the passage of instruments from the penile part of the urethra into the bladder; but during urination it would balloon out and impede the free passage of urine.

Young[(2)] describes three types of congenital urethral valve: the first is produced in a manner similar to that which I have described in the specimen under consideration; the second is formed by a fold of mucous membrane, which runs proximally from the verumontanum, dividing into two valve-like folds which gain attachment to the urethra just outside the vesico-urethral sphincter; and the third is a more or less disk-shaped valve, the outer edge of which is attached to the entire circumference of the urethra. In all three types there is usually a dilatation of the urethra above the valve; the bladder may or may not be dilated, although its wall is as a rule much hypertrophied. Hydroureters and hydronephrosis are of common occurrence.

Extreme dilatation of the bladder is conspicuous in Figure XXXIV, but the walls of the viscus are thin and non-trabeculated. The dilatation of the ureters does not compare with that in other specimens of a similar nature in the museum at the Children's Hospital, and the degree of hydronephrosis, in relation to renal rickets, calls for some comment. Hydronephrosis undoubtedly exists, and is not limited to the renal pelves; the dissection of the right kidney, as illustrated in Figure XXXIV, reveals very dilated renal calyces. It must be allowed, however, that a greater amount of renal parenchyma persists than would have been anticipated had the child died the uræmic death which is the natural climax to the renal insufficiency underlying renal rickets. The intercurrent bronchopneumonia no doubt interrupted the measured sequence of events initiated by the congenital malformation in the urinary tract.

There is no specific pathological basis for renal rickets, and the condition may supervene on any morbid state which induces a sufficient degree of that type of renal impairment in which azotæmia is conspicuous. Chief among such morbid states is chronic interstitial nephritis characterized by fibrosis, granularity and secondary atrophy carried to an extreme degree. Kempson Maddox[(3)] describes the kidneys in renal dwarfism as usually more contracted and fibrotic than those exhibiting the most advanced grades of chronic nephritis in adults, those of the Rose Bradford type not excepted. This author, in reporting three cases of renal dwarfism which came under his own observation, discusses the subject as a whole, lucidly and exhaustively, from all angles of approach—clinical, radiological, biochemical, pathological and experimental. His thesis was based on details of 84 cases, comprising three of his own and 81 drawn from the literature. The easy accessibility of Dr. Kempson Maddox's article would seem to render it superfluous for me to broach the subject of renal rickets; but perhaps not altogether. Kempson Maddox, writing in 1932, drew attention to a "relative degree" of hydronephrosis and hydroureter affecting one kidney as determined by autopsy on one of his patients. With this exception he allowed no place in the morbid anatomy of renal dwarfism to a general dilatation of the urinary tract, stating specifically that no cases of congenital hydronephrosis had been described in this connexion.

In 1933 there appeared a paper by Ellis and Evans,[(4)] from the medical unit of the London Hospital, the object of which was to report 20 cases of renal dwarfism, all but two of which had not as yet been recorded, and to call

attention to the association with this syndrome of an unexplained dilatation of the urinary tract. *Post mortem* examination was permissible in 17 of the 20 cases, and in 14 of the 17 subjects so studied dilatation of the whole or part of the urinary tract was present. As the bladder was involved in all, Ellis and Evans considered that the urinary retention, to which the dilatation was presumably due, must have resulted from obstruction below this level. In no instance was any obvious obstruction found, nor was any abnormality of the nervous system detected. The suggestion was advanced that the underlying lesion was a functional failure of the vesico-urethral sphincter, either the occurrence of spasm, or more probably, on the basis of analogy with what happens elsewhere, a failure of relaxation.

A. Graeme Mitchell,[9] in a detailed review of 78 cases of renal rickets, emphasized in the discussion of the morbid anatomy that, in addition to chronic interstitial nephritis in the usual acceptation of the term, in a number of instances hydronephrosis, chronic infection of the urinary tract and kidney, obstruction in the urinary tract, calculi, or congenitally cystic kidneys, were found at autopsy.

Any condition which results in sufficient damage to the renal parenchyma may therefore furnish the pathological basis for renal rickets.

Malformations in the urinary tract are encountered very frequently in routine autopsy work among children. I am never surprised to find one; and in the course of the daily round and common task when investigation with reference to tuberculous infection has been requested for a child in whom pyuria seems to have become established, I have countered with the suggestion that consideration be given to the possibility of an anatomical abnormality in the urinary tract. Of all such anomalies, that of congenital hydroureter with associated hydronephrosis is the most intriguing. It is not always possible to demonstrate an apparently sufficient cause of obstruction to the urinary outflow as is shown in Figure XXXIV. In the pathological museum at the Children's Hospital there are other specimens with mucosal folds in the posterior part of the urethra; there are also some with none. The so-called congenital valves of the posterior part of the urethra occur in males only; they are usually, but not invariably, closely related to the verumontanum. The condition of bilateral hydroureter, however, occurs commonly in girls as well as in boys, and it not infrequently happens that a patient search, with passages of probes both upwards and downwards through uretero-pelvic, uretero-vesical and vesico-urethral junctions, fails to reveal organic obstruction. Even when an obstacle to the free passage of urine has been found, one is still left wondering. Does the most pronounced prostatic bar, or traumatic or gonorrhœal stricture in adult subjects, ever result in the tortuous, almost convoluted ureters, of size approximating that of the small intestine, so characteristic of congenital hydroureter? When the genesis of the Hirschsprung megacolon is elucidated, perhaps it will prove the solution of the problem of congenital hydroureters.

The question of dilatation of the bladder and ureters in childhood has been discussed by Poynton and Sheldon[10] in an article in which they cite various conditions that have been regarded as obstructive causes. These include congenital torsion of the penis, phimosis, atresia of the urethra, congenital hypertrophy of the verumontanum, cysts of the urethral mucosa and prostate, septa and valvular formations of the posterior part of the urethra. The presence of congenital hypertrophy of the verumontanum in this list is of particular interest in relation to the specimen illustrated in Figure XXXIV. Poynton and Sheldon, in common with Ellis and Evans,[10] Buerger,[11] and others who have written upon the subject, recognize a group of cases of urinary tract dilatation in which no mechanical obstruction can be demonstrated. Buerger,[11] in discussing obstructive factors, mentions, *inter alia*, a "peculiar hypertrophy of the verumontanum" before proceeding to consider the group in which there is no recognizable obstructive cause for the dilatation. Current hypotheses for this group refer it to neuro-muscular defect or achalasia of the vesico-urethral sphincter.

Whatever the essential nature of these mystifying dilatations of the urinary tract, it seems certain that in a proportion of instances they underlie the clinical entity known as renal dwarfism. A short time ago I was shown a pyelogram in which extreme dilatation and tortuosity of the ureters and distended renal pelves, bilaterally symmetrical, were particularly well delineated. The patient, a little girl, fulfilled all clinical requirements for a diagnosis of renal dwarfism.

At the risk of prolonging this discussion to the point at which any interest it may have will become too attenuated, I propose to include, as briefly as possible, notes relating to another child, in whose case the diagnosis of renal dwarfism was made by Dr. A. P. Derham. He exhibited *post mortem* confirmation of this diagnosis, and in addition the feature of urinary tract dilatation.

This patient, Donald P., a boy, aged twelve years, was admitted to the Children's Hospital under the care of Dr. A. P. Derham on October 12, 1926. The boy was undersized and of poor general nutrition. A brownish pigmentation of the skin was distributed in irregular patches over the thorax and abdomen, but was most pronounced on the face. Poorly developed and atonic musculature was a conspicuous clinical feature, and, very significant in the diagnosis of renal dwarfism, a severe degree of *genu valgum*. Other important clinical facts were that the boy had exhibited polyuria since infancy and that during the previous twelve months he had made frequent complaints of pain in the knees and ankles. The urine was of specific gravity 1,010 and contained a small amount of albumin; no cellular constituents could be detected at microscopic examination of the centrifuged deposit. Five days after his admission to hospital the boy became very restless, distressed and cyanosed, and died on the following day. In the meantime his blood urea level had been determined as 283 milligrammes per 100 cubic centimetres, and the McLean urea concentration test had been carried out. In this the kidneys displayed no concentrating capacity whatever. Estimation of the serum calcium and plasma phosphorus content would have been the next step in laboratory investigation, had not the death of the boy forestalled it.

The autopsy was carried out by Dr. Bruce Hunt, who recorded that the left kidney was lobulated, very small, and almost devoid of renal parenchyma. Dr. Hunt described the renal remnant as a fibrous lobulated sac. The ureter on this side was uniformly dilated throughout its length, being of a diameter of 1·3 centimetres (half an inch). The right kidney was similarly but not so extremely affected. On this side approximately one-sixth of the normal amount of renal tissue was present, chiefly cortical tissue. The right ureter exhibited the same degree of dilatation as has been indicated for the left.

Probably by an oversight while writing his account of the autopsy, Dr. Hunt has not recorded the condition of the bladder. If the view that I would advance regarding the *post mortem* findings in this boy is correct, the bladder must have participated in the urinary tract dilatation. I suggest that in this boy the process was one of agenesia of the kidneys, affecting the left side to a greater degree than the right. In view of the clinical history of polyuria since infancy, it would seem not unreasonable to conclude that the dilatation of the urinary tract was consequent on recurring demands made upon it to accommodate large quantities of urine. This would place the urinary tract dilatation in this boy in a different category from that of the infant who furnished the specimen illustrated in Figure XXXIV.

Biochemical Considerations.

The type of change in the bones has been accepted by most writers on the subject of renal rickets as very similar to, if not identical with, that in nutritional rickets of infancy.

In the characteristics of nitrogen retention—depressed value for the serum calcium content (7·9 milligrammes per 100 cubic centimetres) and elevated phosphorus content (6·2 milligrammes per 100 cubic centimetres)—the infant

Lyle C. exhibited what may be termed average findings in the subjects of renal rickets. Extremes of depression of the serum calcium content have been recorded, as has also the excessive figure of 26·7 milligrammes per 100 cubic centimetres for phosphorus content; but such findings have been exceptional, and when encountered have been, so to speak, in the presence of imminent death. In 21 estimations of the serum calcium content carried out in the study of five patients affected with renal rickets, Parsons[1] found the calcium content to be below 9·0 milligrammes per 100 cubic centimetres on only six occasions; but this authority is insistent that although in general the serum calcium content in renal rickets is normal or slightly subnormal, it is always low in relation to the phosphorus content. In a series of ten subjects of renal dwarfism, six of whom displayed bony changes, discussed by Ellis and Evans,[4] the average figure for the serum calcium content was 7·9 milligrammes per 100 cubic centimetres, and 8·5 milligrammes if one with the exceptionally low figure of 3·8 milligrammes is omitted. In general the figures for the blood calcium and phosphorus contents in renal rickets fall within the range of values for chronic nephritis, in which, as is well known, a relatively low calcium content is found along with a high phosphate content.

In renal rickets, retention of phosphorus, a direct result of inability of the kidneys to excrete endogenous phosphates, operate to disorganize the calcium economy, to the extent that not only is there insufficient ionizable calcium available for the adequate ossification of growing bone, but in addition the depletion of calcium may be carried to the point at which tetany occurs. The manner in which a high level of inorganic phosphorus affects the concentration of the serum calcium was shown by the experiments of Binger.[5] In dogs the intravenous injection of phosphoric acid and its sodium salts caused a depression in the serum calcium content. An increase in the inorganic phosphorus from 4·0 to 12·0 milligrammes per 100 cubic centimetres was accompanied by a fall in the serum calcium content from 10·5 to 6·0 milligrammes per 100 cubic centimetres. When neutral or alkaline salts were injected, symptoms of tetany occurred as the serum calcium level fell; but after the injection of acid salts the same depression of the calcium was not accompanied by tetany.

In children affected with renal rickets the tetanic catastrophe does not happen very often, and according to Parsons[1] it is kept at bay by a protective mobilization of calcium from its tissue storage depots. The observations of Ross and Scriver[6] are of interest in this connexion. The workers named showed that ammonium chloride was capable of relieving infantile tetany and restoring the calcium to its normal value in rhachitic children and animals exhibiting a low blood calcium content and normal phosphorus content. This was brought about by its acid-producing effect, which caused a mobilization of calcium from the tissues and presumably from the bones, of a nature similar to that attending the injection of parathyreoid hormone. Such a demonstration of the effect of acidosis in mobilizing calcium ions from the calcium reservoirs would appear to be of great significance; for estimations of the hydrogen ion concentration of the blood have shown that a definite acidosis is present in renal dwarfism, as in chronic azotæmic nephritis in general.

One important factor, therefore, in the ætiology of the bony changes in renal rickets, is the "washing out" of calcium from the bones—a physiological effort directed towards ensuring that the blood calcium shall not fall below the irreducible minimum. As Kempson Maddox[7] has put it, "the free calcium, like the sugar in the blood, is maintained at a constant minimum until the last, notwithstanding what depletion may occur in its stores".

As has been already indicated, phosphate retention is the primary factor in the deranged calcium-phosphorus metabolism found in chronic interstitial nephritis and in other conditions involving an equivalent loss of functioning renal tissue, such as congenital hydronephrosis, chronic obstruction in the urinary tract, polycystic kidneys, or even renal calculi. All the lesions named have figured in case reports as the basis of renal rickets or renal dwarfism. It would seem that the mere presence of a high blood phosphorus level involves a low blood calcium content, unless some compensating process is brought into action.

Not all the calcium present in the blood is available for deposition in bone, ossification being only one of the functions discharged by calcium, and perhaps the least imperative. The immediately available calcium (diffusible or "free" calcium) accounts for 5·0 to 6·5 milligrammes of the total serum calcium content of 10·0 milligrammes per 100 cubic centimetres, the remaining 4·0 or 5·0 milligrammes representing non-diffusible calcium, "bound" to serum proteins. The "free" calcium is almost entirely ionized, and is the fraction of particular functional importance. The tricalcium phosphate in the serum is relatively insoluble, and an inadequate source of calcium ions; but by interaction with the carbonic acid of the plasma it is partly converted into the more soluble calcium bicarbonate, $Ca(HCO_3)_2$, and calcium hydrogen phosphate, $CaHPO_4$. The ionic equilibrium established is represented by the well-known formula of Freudenberg and György:

$$\frac{(Ca^{++}) \times (HCO_3^-) \times (HPO_4^-)}{H^+} = K$$

A change in the concentration of any one ion of necessity induces changes in the concentration of the other ions. In other words, the concentration of calcium ions decreases as the bicarbonate and phosphate ions increase, and increases as the hydrogen ion concentration increases. In renal rickets it is an increase in the phosphate ion which in the first place disturbs the equilibrium expressed in the above formula; accompanying the excess of phosphate ion is usually an acidosis. In those instances of renal rickets in which the serum calcium level remains normal or slightly subnormal, for example in the cases reported by Parsons,[1] the increase in phosphate ion must be balanced by the degree of acidosis.

Children affected with renal rickets and the loss of functioning renal tissue, which is the pathological basis for this clinical phenomenon, maintain this somewhat unstable equilibrium for a varying period of years, life being seldom supported beyond the second decade. The precarious balance is liable to be upset by any intercurrent infection or intoxication, as the result of which a state of severe acidosis, attended by very high blood urea level and non-protein nitrogen level, may be precipitated. In such a crisis the blood in organic phosphorus content may rise to 10·0 milligrammes per 100 cubic centimetres or even higher, with a corresponding fall in the serum calcium level.

A. Graeme Mitchell[8] has brought forward another consideration in the pathogenesis of renal rickets. This author found that among 200 subjects of chronic interstitial nephritis (nephrosclerosis) under the age of twenty years, there were 78 in whom bony changes were evident on clinical or radiological examination. His comprehensive, one might almost say encyclopædic, article has special reference to renal rickets, and he expresses the view that the literature contains no real explanation of the manner in which the osseous changes are brought about. There is no complex biochemistry, no intrusion of "ion products" or bewildering "solubility product constants" in the view of the ætiology of renal rickets put forward by Mitchell. He finds it difficult to believe that the actual concentration of calcium or phosphorus in the circulating blood of these patients is ever too low to permit of calcium deposition, and invites consideration for the following suggestion.

Since it has been repeatedly demonstrated by physiological experiment that there is normally a considerable excretion of phosphorus by way of the intestine, it is reasonable to conclude that with progressive breakdown of the phosphate excretion power of the kidneys, more and more phosphorus will be excreted by the intestine. Even in normal conditions, if the intestinal phosphate excretion level is greatly increased by a high phosphorus intake in the diet, the absorption of calcium is impeded, presumably because of the formation of insoluble tricalcium phosphate. If in nephritis there can occur a shift of excretion of waste phosphates from the kidneys to the intestines, the intestinal phosphate thus being increased, it might be expected that a child with impaired renal

function would suffer calcium starvation by the precipitation of ingested calcium as insoluble calcium phosphate. Such a child should develop a true "low calcium rickets", such as obtains in renal rickets.

Conclusion.

When I set out to focus attention on an interesting museum specimen and place on record two cases of renal rickets I did not intend to write so much. Comment upon this specimen has involved me in excursions into what I have felt to be a more or less familiar land of morbid anatomy, a shadow land of radiology, and a hinterland of biochemistry. In view of the fact that the child Lyle C. was only eighteen months of age, should I have entered into argument to show that his condition was not one of nutritional rickets? To meet this point and establish the diagnosis of renal rickets it is sufficient to reiterate that there was an adequate renal lesion, to recall the azotæmia, and to emphasize the high reading for the plasma phosphorus content.

Those desirous of acquainting themselves more fully with the subject of renal rickets could not do better than read the article by Kempson Maddox[3] and that by A. Graeme Mitchell.[5]

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Reviews.

EXPERIMENTAL PHYSIOLOGY.

The sixth edition of "Schafer's Experimental Physiology" will recall student days to senior medical graduates.[1] They will find in it pages occupied by archaic diagrams of electrical circuits and descriptions of primary cells which have not been used for such work, at least in this country, for decades.

This edition has been prepared by Dr. W. A. Bain, who in the preface expresses his own misgivings about the inclusion of some of the material. He has had a somewhat invidious task. His reluctance to modify drastically what he believes to have been the plan of the original author is natural. Sir Edward Sharpey-Schafer was until recently not only the doyen of British physiologists, but also the editor's own chief.

Some attempt to bring the work up to date has been made by the introduction of experiments on the action of adrenaline and acetylcholine on muscle preparations. Brief descriptions are also given of certain modern pieces of apparatus such as the cathode ray oscillograph. As this kind of apparatus cannot be used by the students for whom the manual is intended, the value of the inclusion of such brief descriptions is doubtful. It would seem better to refer the student to fuller text-books for the description of apparatus used only in demonstrations.

A considerable proportion of the experiments described deal with the muscle-nerve and heart preparations of the frog. A few experiments on mammalian preparations are described, but some of these, too, could be shown only in demonstrations.

We look for a greater proportion of experiments on the human subject in a modern course of experimental physiology for medical students. In the course described in this manual the experiments are limited to a few observations on reflex arcs, some simple experiments on circulation and respiration, and the time-honoured experiments on the special senses.

[1] "Schafer's Experimental Physiology", by W. A. Bain, Ph.D., F.R.S.E.; Sixth Edition; 1938. London: Longmans, Green and Company. Demy 8vo, pp. 192, with 97 illustrations. Price: 7s. 6d. net.

INFANT FEEDING.

As each new edition of Donald Paterson and J. Forest Smith's book, "Modern Methods of Feeding in Infancy and Childhood", is published, it becomes even more nearly complete and more practical.[1]

In this sixth edition the importance of breast-feeding is once more emphasized. A method of choice of artificial food is suggested. The busy practitioner who reads this book will not be lost in a maze of Calories and calculations when seeking a method to feed an infant; but by a very simple and easily remembered formula he will be able to calculate the requirements of any infant if he knows its weight and age, and then he will be told not to forget that "the baby is always the best judge as to whether it is receiving adequate feeds".

It is refreshing to discover that men so experienced in the feeding of infants as the two authors condemn the common practice of overfeeding children over one year of age with milk. "Never urge a child with his milk." The authors encourage the giving of protein twice daily to the bloated, "starchy" baby of one year, so commonly exhibited in baby shows and in advertisements of patent foods.

[1] "Modern Medical Monographs: Modern Methods of Feeding in Infancy and Childhood", by D. Paterson, B.A., M.D., F.R.C.P., and J. F. Smith, F.R.C.P., edited by H. Maclean, M.D., D.Sc., F.R.C.P.; Sixth Edition; 1938. London: Constable and Company Limited. Demy 8vo, pp. 220, with illustrations. Price: 7s. 6d. net.

ORGANIC AND BIOLOGICAL CHEMISTRY.

The publication of a new edition of Plimmer's "Organic and Bio-Chemistry" shows that this text-book still retains its popularity.[2] Its characteristic form remains unchanged in this edition, but some amendments have been made in the text.

As an exposition of the principles of chemical science it suffers from a lack of clarity and order. There are many examples of loose and careless expression, although some of those to be found in the previous edition have been corrected. On page 18 we still find: "The elementary composition, or detection of the elements, precedes the quantitative composition". The molecular structure of glucose is dealt with in a very confusing way. On successive pages we have inconsistent statements of the arrangement of the carbon atoms, first as a straight chain, then as a ring or spiral, then as members of a pyrane ring. The alternative methods of writing the pyrane ring given on page 255 have no significance whatever.

One could hardly imagine a reader, who had his first introduction to organic chemistry through the book under review, being inspired with any desire to pursue his studies further. No general principles are emphasized, and one is left with the impression that the whole subject consists of innumerable unrelated facts, interspersed with complicated formulæ for which no rational basis seems to exist.

[2] "Organic and Bio-Chemistry", by R. H. A. Plimmer, D.Sc.; Sixth Edition; 1938. London: Longmans, Green and Company. Royal 8vo, pp. 633, with illustrations. Price: 21s. net.

The Medical Journal of Australia

SATURDAY, APRIL 8, 1939.

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THE PROBLEM OF THE VENEREAL DISEASES.

For approximately twenty years legislation directed towards the control of venereal diseases has been in operation in most of the States of the Commonwealth. This type of legislation was first introduced in Western Australia and has been brought into force in every State except South Australia. It is reasonable after this lapse of time to inquire whether the expected results have been obtained, or to what extent we have fallen short of the goal. The evidence available suggests that there has been a decline in the incidence of syphilis, though apparently this is chiefly due to effective modern methods of treatment with arsenical preparations. The sources of this disease cannot be regarded as being under control, since recrudescences of acute infections occur from time to time. In New South Wales during the past twelve months such a recrudescence has been only too obvious and primary chancres which, for some years, have been a diminishing if not rare manifestation of the disease, have become comparatively common. Gonorrhœal infections, far from having been reduced in number, give every indication of a tendency to increase. Doubtless the same statement would hold good for other States. Whether the recent introduction of the sulphonamide group of compounds will produce similar beneficial results in the prevalence of gonorrhœa as have been produced by the arsenical preparations in syphilis can be determined only by further experience.

The Scandinavian countries, especially Sweden and Denmark, have achieved a substantial measure of success in reducing the incidence of syphilis, but have been no more successful than other countries in reducing the incidence of gonorrhœa. These countries were, however, the first to organize successfully a comprehensive programme, including legal compulsion, for the control of venereal diseases. For many years the attention of other countries was focused on legal machinery, and the beneficial results of the Scandinavian scheme were too readily ascribed to that agency of control. Further experience and investigation now suggest that compulsory treatment is not the major factor influencing results. Compulsion, if used with discretion, has a certain value. By its means, reckless or indifferent patients can be forced, if necessary, to continue treatment, even though all morbid manifestations have subsided — an important measure in the control of syphilis. Such powers are often the deciding factor in supporting the courage and endurance of patients to persist in what is virtually preventive treatment. Success depends upon the close coordination of a number of factors, the most important being the provision of adequate facilities for efficient diagnosis and for early treatment which must be available free of charge to all sufferers. The most noticeable features of the Scandinavian arrangements are the smoothness with which they work. The people of these countries are well educated and have for law and constituted authority a respect which is highly developed and practically universal. Scandinavian countries have a high standard of medical education, the medical profession occupies a very influential position, patients have complete confidence in their medical attendants, and consequently they cooperate in following carefully the instructions regarding treatment. In Australia, on the other hand, our attitude

is more individualistic, and even certain members of the medical profession feel that they are asserting a virile independence if they ignore their legal responsibility to notify cases, or otherwise fail to cooperate with departmental organizations. In consequence of the interactions of the several factors concerned we have at one end of the scale the Scandinavian countries with legal control, excellent organization and satisfactory results. At the opposite end we have the United States of America with no restriction of the liberty of the subject, no great facilities for treatment and a high incidence of venereal disease. Between the two extremes there are other countries, including Australia, with incomplete organization and with results which, whilst not unsatisfactory, fall far short of what is, or could be readily made, possible.

Within limits public health can be purchased; but money alone cannot ensure an informed public opinion on a problem which has many social implications, and concerning which any attempts to spread educational propaganda usually arouse resistance. Unless methods can be found to overcome public apathy and indifference, and to secure the full cooperation of all concerned, it is not possible to meet the needs of this extremely difficult problem. What we have been pleased to call the virile independence of Australian medical practitioners could easily be described in less happy language. Members of the profession prate of preventive medicine and talk of teamwork more than any other body of men. As far as their attitude to the control of venereal disease is concerned, we are justified in calling their sincerity in question.

Current Comment.

SQUAMOUS CELL CARCINOMA OF THE PELVIS OF THE KIDNEY.

In his well-known book on neoplastic diseases Ewing divides epithelial tumours of the kidney into the following four groups: (*a*) adenoma, single and multiple, essentially benign, and arising from renal tubules; (*b*) adenocarcinoma and carcinoma arising from renal tubules, and often from adenomata; (*c*) papilloma and papillary carcinoma of the pelvis; (*d*) adrenal tumours and hypernephroma. In discussing epithelial tumours of the renal pelvis and ureter, he points out that they may take the form of (*a*) papilloma, (*b*) papillary epithelioma (epidermoid carcinoma), (*c*) alveolar carcinoma. The structure of papillary carcinoma presents two distinct types: (*a*) simple papillary epithelioma, suggesting a relation to benign papilloma, and (*b*) squamous cell carcinoma.

Squamous cell carcinoma of the renal pelvis was described by Kundrat in 1891; it is of comparatively rare occurrence when compared with neoplasms of the kidney. In reporting five cases from the Cleveland Clinic (United States of America) Charles C. Higgins states that in a collected series of 337 tumours of the renal pelvis Joly found 50 squamous cell carcinomata.[1] He adds that the subject is made difficult by the many different names given to these tumours. He has found records in the literature of 59 cases; his cases bring the total up to 64. Ewing states that these tumours are usually of a large size when they are discovered; he adds that Battle observed squamous changes in a small villous tumour of the pelvis, and Rundle found the upper part of the ureter to be invaded by a squamous carcinoma of moderate dimensions. Two of Higgins's five patients had large palpable tumours when they were first seen. In one of the remaining three instances the presence of the tumour was revealed on pyelography by compression and infiltration in the upper three-quarters of the right kidney. Another patient was submitted to pyelography on two occasions before a diagnosis of neoplasm was suggested. All five patients complained of symptoms "referable to pyuria", due to a calculus or to chronic inflammation, and of pain in the back. According to some observers hæmaturia is not often present with growths of this kind; all five patients in Higgins's series complained of it. Higgins states that diagnosis may be difficult, even if all available facilities are employed. The condition must be distinguished from tumour involving the renal parenchyma, from non-opaque calculi in the renal pelvis, and from renal tuberculosis in an early stage. Pyelography is the most important means of establishing a diagnosis. Once the diagnosis is made, nephrectomy must be carried out with the least possible delay. Higgins used preoperative X radiation, but did not find that it brought about any reduction in the size of the tumour. He thinks that X ray therapy should always be used after operation. The prognosis is always grave. Higgins has not been able to find in the literature any report of a patient who was free from metastasis at the end of five years. One of his five patients was alive at the time he made his report and had no sign of metastasis three years and eight months after operation.

The pathological aspect is as interesting as the clinical is depressing. Silverstone, in reporting a case in 1935 in *The British Journal of Surgery*, stated that squamous epithelioma in the urinary tract arose from epithelium that had undergone

[1] *Archives of Surgery*, February, 1939.

"metaplasia due either to infection, prolonged or of short duration but acute, or to chronic irritation from stone". Leucoplakia and renal calculi are the two conditions most commonly associated with squamous carcinoma of the renal pelvis. Winsbury-White, writing in the same journal in 1932 on leucoplakia of the urinary tract, stated that the most acceptable theory of the ætiology of leucoplakia was that it was a deficiency disease. He referred to the work of Wolbach and Howe and of McCarrison, all of whom showed that deficiency of vitamin *A* produced among other conditions keratinization of the epithelium of mucous surfaces, including those of the urinary tract. Winsbury-White writes: "The obvious difficulty in determining the true relationship between infection and epithelial changes is to know which existed first. If infection is to be considered the cause rather than the effect, the question naturally arises why leucoplakia is so comparatively rare while infection is common. Examination of the bacteriological reports dealing with the infections has thrown no light on the ætiology, as a great variety of organisms have been described. But McCarrison has shown that infection is also a common result of deficiency in diet. This evidence therefore considerably weakens the theory of metaplasia. This investigator maintains that the epithelial changes noted are independent of infection, though this is often superimposed on them, and that they are in the nature of breaches in the body defences against bacterial invasion." Ewing has stated that the pelvic and ureteral epithelium is capable of extensive epidermization, but that as all cases are not associated with calculi or leucoplakia, the excessive hornification must be regarded as a tendency inherent in the growth. Other writers have held that if infection was of importance from the ætiological point of view, tuberculosis of the kidney would be more commonly associated with carcinoma. The subject is attractive as a field for speculation, but further than this we cannot go.

THE INSTRUMENTAL DILATATION OF THE PAPILLA OF VATER.

"It is common knowledge among surgeons that calculi in the common bile duct are frequently overlooked. Consequently, the common duct is explored at the time of cholecystectomy in an increasing percentage of cases. The exploration is not considered complete unless the patency of the papilla of Vater is proved, and this step is often combined with systematic instrumental dilation of the papilla." With these words C. H. Branch, O. T. Bailey and R. Zollinger introduce a report of experimental investigations carried out by them.[1] They have tried in a series of experiments on dogs to reproduce as nearly as possible the conditions of operation on the human subject. Dogs were chosen because the papilla and the intramural portions of the common bile duct of dogs more nearly resemble the corresponding regions in man than do those of any other animal commonly used in the laboratory. The procedures adopted were of several types; they included: cholecystectomy alone; cholecystectomy with dilatation of the papilla; cholecystectomy with transduodenal dilatation of the papilla with catheters; cholecystectomy with transduodenal dilatation of the papilla with Bâkes dilators; cholecystectomy with dilatation of the papilla with Bâkes dilators and drainage of the common duct; cholecystectomy with dilatation of the papilla after an interval; cholecystectomy with dilatation of the papilla and redilatation after an interval; dilatation of the papilla without previous cholecystectomy. These experiments were all designed to determine the late changes resulting from the several procedures. In addition experiments were designed to show the early effects of dilatation. During the first week after its dilatation the papilla of Vater becomes obstructed as a result of exudate in the duct and œdema of the surrounding tissues. When dilatation was considerable scarring was found in the region of the papilla, and a certain amount of dilatation of the extrahepatic ducts was always present. This dilatation varied directly with the amount of scarring found round the papilla. The dilatation was less when the common duct had been drained. The general conclusion was that after dilatation the lumen of the papilla returned to what was to all intents and purposes its initial size. In some of the experiments the final size of the lumen was, as might be expected from the contraction of scar tissue, somewhat smaller than the size which was regarded as normal for the animals.

The conclusions to be drawn from this work are obvious. When a surgeon, having explored the common duct, passes dilators down into the duodenum, his first care is doubtless to make certain that the lumen is clear. If for this purpose he uses an instrument which ought to pass without tearing the tissue of the sphincter of Oddi and the surrounding parts, he will probably do no harm. If he thinks that by passing larger dilators he will be able to increase the size of the lumen to facilitate the passage of its contents, he will not only be disappointed, but he will inflict a permanent injury on the tissues. The requirement here, as in most parts of the human body, is gentleness and a respect for the tissues, for by these alone will good results be obtained.

[1] *Archives of Surgery*, February, 1939.

THE CARE OF DIABETIC GANGRENE.

The vascular complications of diabetes are now more important than ever. The spectre of coma is by no means a thing of the past; coma in diabetes is still a serious though preventible danger, and to a much less extent the other complications may also be mitigated by intelligent and assiduous care. But it is hard to see how the peril of gangrene will ever be entirely controlled. That relatively benign

form of the disease which is so common in the elderly gradually or sometimes quickly manifests itself in an individual whose vascular system is already damaged, and to the dangers attendant on violent dislocations of the general metabolism are added those peculiar to the arterial and arteriolar tree. We may at the moment pass over the cerebral and coronary accidents that are only too common, and concentrate on peripheral vascular lesions. Samuel Silbert, in discussing diabetic gangrene and its conservative handling, states that during the past fifteen years diabetic gangrene of the extremities has become more frequent and that more amputations are now performed for this condition than before the introduction of insulin.[1] This really means that in a great number of cases infection comes to complicate arterial blocking. Silbert points out that the outlook for preservation of the leg of a diabetic patient with gangrene when secondary infection has occurred is usually poor, and in stressing the need for prophylaxis against this unfortunate event states that this responsibility is particularly that of the family physician. This is very often true; it is usually the family doctor who sees the limb when necrotic changes are threatening, and it is he who must set about maintaining the sterility of the gangrenous zone. The tips of the toes are usually first affected; these are dry and uninfected in the early stages, and it is vitally important that absolute rest is enjoined and that the gangrenous area should be kept sterile. Silbert advises that the entire foot should be painted with a 5% solution of picric acid in alcohol and that a sterile dressing should be applied up to the ankle. Pressure is guarded against, both between the foot and bed or bedding and between the toes, and the picric acid is reapplied at each dressing. That the urine should be completely free from sugar may be taken as an axiom. Silbert does not make much mention of measures directed towards the increasing of vascularity in the limb, though he refers to the use of vasodilator drugs, postural exercises, the recently introduced mechanical devices for producing alternate positive and negative pressure, and, surprisingly also, the free use of alcohol by mouth. But he utters a warning against the incautious use of heat, and prefers a thermo-regulated cradle which will not permit a temperature of over 95° F. The really vital point in treatment is the prevention of infection, as above stated, and the chief diagnostic points are stated to be elevation of temperature, increased insulin resistance and lymphangitis. The author remarks that even the existence of a moderately good circulation does not minimize the seriousness of the onset of infection in diabetic gangrene; but it should be remembered in this connexion that infection tends to increase and to spread the existing endarteritis and thus to set up a vicious circle. It will be generally agreed that the prognosis is better when the dorsum of the foot only is affected, for spread of the infective process to the plantar surface opens up a greater number of tissue planes. Silbert advocates a conservative attitude if and when amputation becomes necessary, and believes with a number of other surgeons that amputation may in many cases safely be performed below the knee. Certainly the published figures for mid-thigh amputations in these cases are depressing, the mortality percentages quoted in this article ranging from 18 to 60. Silbert operates in two stages. No attempt is made at first to provide a good stump, a simple guillotine amputation being done above the ankle. Several weeks later a secondary plastic operation is carried out, and excellent results are claimed. This author makes little reference to the actual indications for amputation, but the current opinion is that, provided the pain, temperature and toxic symptoms due to infection are absent or very slight, it is advisable to be very patient in these cases, for it is surprising sometimes how much of a limb may be saved. Such conservatism may be practised only when the gangrenous process is not complicated by sepsis; and as this is really preventible, it is the clear duty of everyone concerned in caring for a diabetic with gangrene of an extremity, however slight in degree, to concentrate on the maintenance of the sterility of the affected zones.

[1] *Journal of the Mount Sinai Hospital, New York*, November-December, 1938.

ERRORS IN ERYTHROCYTE COUNTS DUE TO HAYEM'S SOLUTION.

The enumeration of the red cells of the blood is usually regarded as a comparatively simple procedure; yet difficulties and discrepancies may arise in its performance. Ying Chang Ch'u and Claude E. Forkner[1] point out that some of the fluids more commonly used for dilution of the blood in order that the red cells may be counted, are by no means satisfactory. The solution devised by Hayem in 1878 is almost universally used and is recommended by the authors of most standard text books as the best diluting fluid. It contains 0·5% sodium chloride, 2·5% sodium sulphate and 0·25% mercuric chloride. A few workers have recorded difficulties with the use of this fluid; Hayem himself considered the use of his diluent unsatisfactory when the "fibrin" content of the blood was increased. Ch'u and Forkner state that Hayem's solution is unsatisfactory as a diluent for the red blood cell counts of some patients, because it produces a coarse precipitate in the blood plasma and brings about clumping of erythrocytes, with resulting uneven distribution and significant error in the counts. This phenomenon was observed during the course of studies of the blood of patients with nephritis, cirrhosis of the liver, kala-azar and other diseases. It was not observed in red cell counts made with the blood of normal persons or of patients with a variety of diseases other than those specified.

The authors have made a search, both in the medical literature and by means of experiments,

[1] *The Journal of Laboratory and Clinical Medicine*, September, 1938.

for other diluting fluids which would give more satisfactory results. Solutions of chemically pure sodium chloride (0·85%) usually gave satisfactory results when the counts were made immediately after collection with very carefully cleaned apparatus, and when great care was used in the preparation of the solution with neutral distilled water. Occasionally, even with these precautions, hæmolysis occurred. Of all the solutions tried, that of Gowers, as given by Mallory and Wright, seemed to be the most satisfactory. This solution contains 6·25% of sodium sulphate and 16·6% of acetic acid. Statistical analysis of erythrocyte counts of a group of patients with kala-azar showed that the error with Hayem's solution was significantly great, whereas the use of Gower's solution introduced no appreciable error. The authors mention Toisson's fluid, but observe that there is difficulty in cleaning pipettes after its use. They believe that in the hands of careful and well-trained workers no significant error will be encountered if Hayem's solution is used in the counting of red cells of normal persons. However, on account of the presence of precipitated material even in the blood of normal persons, the use of Hayem's solution introduces the factor of rapid sedimentation of the corpuscles in the pipette; and this tends to cause error in the hands of the less well-trained intern or technician.

In this last sentence lies the crux of the matter. Even such a comparatively simple procedure as a red cell count requires discrimination, experience and intelligent interest. The authors are to be congratulated on their illuminating study of what is often regarded as a very dull technical procedure, and on their detection of a source of error which is not mentioned in most standard text-books on the subject. The performance of blood counts is too often left to technicians who have but a small background of interest or experience and whose time is so filled with routine work that they are unlikely to pay much attention to such discrepancies as may from time to time occur.

BLOOD TRANSFUSION.

Modern technique has made blood transfusion a safe and comparatively simple procedure. Provided blood donors are available, transfusion may be carried out with very little delay. There are occasions, however, when even the slightest delay is of consequence, and in view of this the use of stored blood has been advocated. From Moscow came the suggestion that corpse blood should be used, and there have recently appeared in the American literature a number of communications on the possibility of using placental blood for transfusion. British workers, slower and more fastidious, if less inexorably logical, have been reluctant to use stored blood, even when the source was a living donor. This wholly natural, if somewhat unscientific, reluctance seems to be justified by events. That stored blood is not equivalent to freshly drawn blood in all respects is becoming apparent. Workers at the Cook County Hospital, United States of America, have shown that the incidence of reactions in the recipient increases with the length of time the blood has been stored. Jonathan E. Rhoads and Lillian M. Panzer[1] have shown that blood which has been stored for a week or more is deficient in prothrombin content, and is practically useless in the treatment of the acute prothrombin deficiency encountered in jaundiced patients. Further, it is improbable that the leucocytes survive for more than a few hours in stored blood. It is quite possible that further experience will show that this is not the only respect in which stored blood is inferior to freshly drawn blood.

The suggestion that placental blood should be used for transfusion is dealt with in a common-sense way by John Howkins and H. F. Brewer.[2] Using the aseptic technique described by Goodall and his associates, they collected blood from the placental cord of fifty patients immediately after the delivery of the child. They excluded cases in which there was any likelihood of infection, and also those in which the baby was asphyxiated. The average yield obtained from each placenta was 47 cubic centimetres, and the maximum 90 cubic centimetres. The sterility of the various samples was investigated at periods varying from six to fifteen days after collection, and it was found that 22% of the samples were contaminated. The infecting organisms comprised *Bacillus subtilis* (12%), *Bacillus coli* (6%), *Staphylococcus albus* (2%) and *Bacillus pyocyaneus* (2%). Repeated cultures were made at intervals; in all but one instance the results were the same. The infecting organisms may have been air-borne or may have been derived from the genital tract. The authors do not agree with Goodall in his assertion that culture of the collected blood is unnecessary, nor with Grodberg in his statement that any stray organisms present are usually killed by the leucocytes. They permit themselves to remark that they would hesitate to sponsor the light-hearted intravenous infusion of a thriving colony of *Bacillus subtilis*, let alone one of *Bacillus pyocyaneus*. They observe too that the pooling of several samples of blood, although of the same group and apparently compatible, is not devoid of risk. They admit that their collection of blood was not made by specially trained workers, but an aseptic technique was used; and it is evident that if this source of blood were to be of practical value, it would need to be possible to entrust the collection of the blood to the ordinary personnel of a hospital obstetric unit. In the opinion of Howkins and Brewer, in such hands this source of blood is uneconomical in quantity and unsafe for use in the treatment of patients. When all is said and done, the best source and also the best storehouse of blood is the living donor. A well-organized and sufficiently large voluntary donor service should be available in every centre of population.

[1] *The Journal of the American Medical Association*, January 29, 1939.
[2] *The Lancet*, January 21, 1939.

Abstracts from Current Medical Literature.

OPHTHALMOLOGY.

Vitamin C Metabolism and Cataract.

J. Urbanek (*Klinische Monatsblätter für Augenheilkunde*, Volume CI, page 670) states that vitamin *C* deficiency is the cause of most cases of intraocular hæmorrhage following cataract extraction. He has completely avoided post-operative hæmorrhage by giving vitamin *C* to all patients with cataract. On giving 300 to 500 milligrammes of pure ascorbic acid to a series of patients he discovered that young patients with cataract excreted more ascorbic acid in the urine than senile patients with cataract; that most patients with cataract were deficient in vitamin *C*; that old patients required much more vitamin *C* before the saturation point was reached; and that much more vitamin *C* was acquired by people living on a good mixed diet. He suggests that the purely vegetarian diet of a large percentage of the population of India may be the cause of presenile cataract. Vitamin *C* saturation of the urine does not necessarily indicate tissue saturation. A true guide is found only by serum examination. Vitamin *C* deficiency, the author believes, is not the cause of cataract, although in old age there is much less vitamin *C* in the tissues than in the young. He has examined well-nourished senile cataract patients whose vitamin *C* tissue content was normal. The aqueous humour shares in the vitamin *C* deficiency of other tissue fluids, but deficiency appears later in the aqueous and saturation also appears later than in the serum. The lens does not appear to play any role in the saturation of nor in the formation of vitamin *C* in the aqueous. Treatment of patients with vitamin *C* produced many beneficial effects on their general health as well as on their psychological state, and these, in the author's opinion, should delay the formation of cataract if vitamin *C* is taken before visual disturbance has set in. Furthermore, vitamin *C* has a direct action on the hormones which also influence cataract formation.

Experience with Contact Lenses.

C. H. Sattler (*Klinische Monatsblätter für Augenheilkunde*, Volume C, 1938, page 172) states that he has supplied contact lenses to over two hundred patients since 1930, when, at the Königsberg Congress, Birsch-Hirschfeld raised the question of risk to the eye. None of the author's patients has suffered any injury apart from the transient superficial corneal haze that is occasionally found. He has found that lenses with a corneal radius of from 7·5 to 8·0 millimetres are the most easily worn. A number of high myopes who were unable to wear Heine's afocal lenses of from 9·0 to 10·0 millimetre radius were relieved by contact lenses with a corneal radius of 8·0 millimetres and a corresponding grinding. Approximately 10% of lenses ordered by the author had a diameter of 22·0 millimetres instead of 20·0 millimetres. The former could be worn with more comfort than the latter. The author tests every suitable patient with a lens of 8·0 millimetres corneal radius with the best possible visual correction. If the patient experiences discomfort he tries various haptic radii at 0·25 millimetre intervals. If discomfort persists, lenses with optical radii of 7·5 and 8·5 millimetres are tried and those with a 22·0 millimetre diameter. He never orders a lens until the patient has worn it for five hours, found it comfortable, and can fit and remove it himself. Of the lenses that he ordered, 72% had a haptic radius of 12·0 millimetres. The radius of the remainder was between 11·0 and 12·5 millimetres. In three cases patients with corneal opacities were ordered umbral glasses. Of the patients, 20% were scholars and 10% soldiers. Aviators and sportsmen, particularly swimmers, were enthusiastic wearers of contact lenses. Two-thirds of the patients were short-sighted, and there were sixteen cases of aphakia. Most of the patients were able to wear the lens all day, some preferring to leave it out for a time at midday. One lens was worn for forty hours without a harmful result. Ten of the twenty-four patients whom the author could not fit with Zeiss glasses wore Dallos lenses. Eleven wore Müller-Welt's lenses, and three were ordered Müller's lenses. These patients had scleral astigmatism. Müller supplied one lens with an iris for an aphakic patient with traumatic aniridia.

Use of Sorbitol in Glaucoma.

J. Bellows, I. Puntenney and J. Cowan (*Archives of Ophthalmology*, December, 1938), while admitting the value of intravenous injection of hypertonic saline solution in the reduction of ocular hypertension, state that its use is limited. There are objections also to dextrose and sucrose. In their efforts to find a substance relatively non-diffusible, non-toxic, effective in small quantities and suitable for diabetics, they hit upon sorbitol. One hundred cubic centimetres of a 50% solution injected intravenously and repeated in twenty-four hours if necessary will reduce ocular tension. Sorbitol is a complex alcohol.

Periarterial Sympathectomy of the Common and Internal Carotid Arteries with Removal of the Carotid Body.

Nizetic, Spiridonovic and Bukurov (*Klinische Monatsblätter für Augenheilkunde*, Volume C, 1938, page 817) have studied the changes occurring after periarterial sympathectomy of the common and internal carotid arteries with removal of the carotid body, and have paid particular attention to those in the retina and optic nerve. The changes include: (*a*) Bernard-Horner's syndrome, which is less pronounced than after ramisection of the sympathetic; (*b*) hyperæmia of the conjunctiva; (*c*) changes in the retinal blood vessels; (*d*) lachrymation, (*e*) a rise in ipsilateral tension of about 4·0 to 5·0 millimetres. After a unilateral sympathectomy there is a fall in tension of both eyes, which is followed by hypertension of two to five days' duration. Before the tension becomes constant there is a further brief period of low tension, followed by one of oscillation. An incision 6·0 to 8·0 centimetres long was made on the anterior side of the sterno-cleido mastoid muscle. It commences at a point corresponding to the angle of the mandible and runs obliquely to the upper edge of the thyreoid cartilage. The authors describe this operation in detail. They point out how easy it is to confuse branches of Hering's nerve with fibrous tissue. A local anæsthetic was always used, as this obviates the accompanying toothache and earache. The authors have had no real success from this operation in the treatment of optic nerve and retinal degeneration. Seven of thirty-two patients with optic atrophy manifested some improvement. In three of five cases of *retinitis pigmentosa* improvement occurred, and in two the condition remainded unchanged. The alteration in the retinal and the general circulation was approximately the same whether decortication of the common and internal carotid or removal of the carotid body was carried out or not. The results were greater if a bilateral operation was performed.

Bilateral Accommodation Paralysis in Sphenoidal Sinus Disease.

N. B. Ellis (*American Journal of Ophthalmology*, December, 1938) records the history of an athletic young man who had failure of accommodation in both eyes and in the right a central scotoma. Trouble was found in the sphenoidal sinus. Both sinuses were opened up. "Within an hour the patient was given a book and could read small print at the ordinary near point, even without his distance correction."

Retinal Tears and End-Vessels.

A. Vogt (*Klinische Monatsblätter für Augenheilkunde*, Volume CI, 1938, page 861) adds further to knowledge concerning the close relationship that exists between groups of retinal tears and certain end-vessels. All the branches of a vessel may be associated with holes and cysts like a bunch of berries. This state was present in both eyes of a fifty-six year old woman who was emmetropic. In one eye at least ten holes were found between the 5 and 12.30 o'clock positions in the temporal periphery, divided fairly evenly over the end-vessel area. No hole was present in the other half of this eye, but in the temporal periphery of the other eye there were many holes, mostly between the 7 and 11 o'clock positions. These had not

produced a detachment. However, the affected areas in each eye were treated by catholysis and diathermy. The holes were closed and the final vision was 6/6 with full fields. The author considers that these findings confirm his views that symmetrical obliteration of an end-vessel may lead to cystoid degeneration and then hole formation, with or without detachment.

In another short article in the same issue of *Klinische Monatsblätter für Augenheilkunde*, the same author describes white precipitate-like deposits in the subvascular layer of detached retinæ. They sometimes coalesce and form plaques, which in rare cases lie in front of the vessels. After operative therapy these spots disappear completely; they disappeared even in a fifty-six year old woman, in whom the spots were found over the whole area of detachment. The histological nature of these spots is unknown. They must not be confused with much smaller white shining points which often cover most of the detached part and which may appear as a threatening sign before detachment occurs when such a state exists in the other eye.

OTO-RHINO-LARYNGOLOGY.

Suppuration of the Petrous Pyramid.

ROBERT L. MOOREHEAD AND JOHN P. BAKER (*Archives of Otolaryngology*, October, 1938) describe suppurative conditions of the petrous pyramid and discuss when and how to operate in these conditions. This study is based on a series of thirty consecutive cases in which operation was performed and pus was found in the pyramid. The authors consider that the time of onset of the various symptoms and signs is of great significance. Thus if a patient is operated on for acute mastoiditis, remains well for three or four weeks and then has pain over or in the eye, together with signs of a low-grade sepsis, the pain is of far greater importance than if it had occurred shortly after the operation. When such symptoms and signs present themselves and show no diminution after a reasonable period of observation, the risk to the patient is in most instances decreased if the pyramid is explored. The character, extent and severity of the pain will often give warning of an advancing suppurative process. The patient becomes more and more restless at night and pain increases in severity; there may be considerable pain during the day as well. If paralysis of the external rectus muscle occurs, the time of its onset is significant, for paralysis coming on after many days of pain and fever always signifies extension of the suppurative process. This is true also of partial facial paralysis; but the latter may soon disappear, whereas the former invariably persists until the condition is remedied. Repeated X ray examination may reveal variations in involvement over a period of time; but in the authors' experience this has not been a valuable aid. In early involvement, when a simple mastoidectomy has not been performed, a simple mastoid operation should be carried out, except in the presence of meningeal irritation or other urgent signs. When a simple mastoidectomy has been performed, much depends on how recently this has taken place. If the operation was recent and the pain is not increasing, an expectant attitude may be adopted, whether the amount of discharge is increasing or decreasing. The longer the interval of time before the appearance of petrosal involvement after the simple mastoid operation has been performed, the greater the probability that further drainage will be necessary. If pain round the eye appears at a considerable period after the simple mastoid operation, and is accompanied by low-grade sepsis, and if this shows no signs of improvement after a few days' observation, it is probably better to explore the pyramid than to wait for meningeal irritation. There is much less risk in exploration than there is in the meningitis that may suddenly develop. The authors have made frequent use of spinal puncture; any increase in the number of cells renders immediate operation more imperative.

Tonsillectomy in School Children.

J. ALISON GLOVER (*Proceedings of the Royal Society of Medicine*, August, 1938), in a paper dealing with the performance of tonsillectomy in school children, gives the following summary. The number of operations upon the tonsil remained low until after the beginning of the twentieth century. About 1902-1903 a rapid rise began; there was a partial lull during the War years, after which the rise accelerated sharply, reaching a peak in 1931. There was then a sharp fall. In 1936 a second rising curve began. The number is higher in boys than in girls. The operation is performed most often in the period five to seven years, the peak being usually in the sixth year. The average age of girls operated on is higher than that of boys. More attention should be given to sex grouping, and especially to age grouping when the necessity for operation is considered and its results are assessed. The recent work of Epstein and others suggests that the age at which the operation is performed is too low for the best results to be obtained. The great number of operations performed on children between five and seven years of age is the result of the performance of many operations on tonsils for enlargements which are either physiological or immunological. A study of the geographical distribution of elementary school children submitted to operation discloses no correlation between the number of operations and any impersonal factor, such as overcrowding, poverty, bad housing or climate. The number is not correlated with the general efficiency of the school medical and dental services of the area. In fact it defies any explanation, save that of variations of medical opinion on the indications for operation. Large and, in some cases, drastic reductions in the numbers of operations performed on elementary school children in certain areas have had no unsatisfactory results. Tonsillectomy is at least three times as common among well-to-do people. The more fortunate the child in all other circumstances and the better the opportunities for careful nurture, so much the more is he liable to be subjected to tonsillectomy. In the public schools the picked athletes among the boys have their tonsils removed in exactly the same proportion as the other boys in the schools they represent. The mortality from the operation is larger than is generally appreciated. Though, as Dean has recently said, "practically the removal of tonsils is always a gamble", yet no impartial observer will deny that in certain cases tonsillectomy has brilliant results. The author concludes that tonsillectomy is performed too often without adequate cause or without sufficient regard to the possibility of enlargement being temporary, physiological or immunological. He quotes the opinion expressed by the Schools Epidemic Committee of the Medical Research Council, that "it is a little difficult to believe that among the mass of tonsillectomies performed today all subjects for operation are selected with true discrimination, and one cannot avoid the conclusion that there is a tendency for the operation to be performed as a routine prophylactic ritual for no particular reason and with no particular result".

Perforation of the Œsophagus by Foreign Bodies.

JEROME R. HEAD (*The American Journal of Surgery*, October, 1938) reports five cases of perforation of the œsophagus by a foreign body, together with sixty-seven cases collected from the literature. An analysis of these seventy-two cases indicates that pointed objects are most apt to cause perforation. The foreign body became lodged in the cervical part of the œsophagus in 62·6% of the cases and in the thoracic portion in 17·1%. In 20% the location was not mentioned. In forty-three cases no operation was performed. In 60% of these the patient recovered, and in 39·5% the patient died. In the whole series there were twenty-eight deaths and forty-four recoveries. The consensus of opinion is that perforation of the cervical part of the œsophagus is an indication for immediate prophylactic mediastinotomy. On perforation of the thoracic part of the œsophagus, in which dorsal mediastinotomy would be required, expectant treatment until signs of serious infection are observed is indicated. The value of postural drainage with the patient in the prone position and the foot of the bed elevated is emphasized.

British Medical Association News.

MEETING OF THE NATIONAL HEALTH INSURANCE COMMITTEE OF THE FEDERAL COUNCIL OF THE BRITISH MEDICAL ASSOCIATION IN AUSTRALIA.

A meeting of the National Health Insurance Committee of the Federal Council of the British Medical Association in Australia was held in the Medical Society Hall, East Melbourne, on March 12 and 13, 1939, Sir Henry Newland, President of the Federal Council, in the chair.

The following representatives of the Branches were present:

New South Wales: Dr. George Bell, Dr. H. R. R. Grieve, Dr. R. C. Traill, Dr. W. F. Simmons.
Queensland: Dr. D. G. Croll, Dr. T. A. Price, Dr. L. P. Winterbotham.
South Australia: Sir Henry Newland, Dr. F. St. J. Poole, Dr. A. F. Stokes.
Tasmania: Dr. W. L. Crowther, Dr. J. R. Robertson.
Victoria: Dr. H. C. Colville, Dr. F. L. Davies, Dr. D. M. Embelton, Dr. J. H. Gowland.
Western Australia: Dr. K. Aberdeen, Dr. F. W. Carter, Dr. L. A. Hayward.

Dr. J. G. Hunter (General Secretary) and the Editor of The Medical Journal of Australia also attended, and Dr. L. E. Le Souef (Western Australia) was present by invitation.

Various matters dealing with the organization of the profession and matters of policy were considered by the Committee.

A special meeting of the Committee was held on the following Saturday (March 18) at 9 a.m., in Melbourne, to discuss the new proposals of the Commonwealth Government, as submitted by the Commonwealth Treasurer, the Honourable R. G. Casey, P.C., to a conference of representatives of the Federal Council, friendly societies and other approved societies on the previous afternoon, Friday, March 17.

On the afternoon of the same day the members of the Committee met in conference the members of the Federal Consultative Committee of the Friendly Societies, along with several representatives of other approved societies and representatives of the Pharmaceutical Association of Australia and New Zealand. At this conference the proposals of the Commonwealth Government were fully discussed, and it was decided that a small committee, consisting of five representatives of the British Medical Association, five of the friendly societies, and one of the Pharmaceutical Association, should meet on the following morning to consider what statement should be submitted to the Treasurer. A copy of the joint letter which was subsequently sent to the Treasurer is as follows:

Melbourne, 20 March, 1939.

The Hon. R. G. Casey, D.S.O., M.P., P.C.,
Federal Treasurer,
Sub-Treasury, Melbourne.

Dear Sir,

National Health Insurance.

I have the honour to convey to you the following decisions of a joint Conference of the representatives of the British Medical Association, and of the Friendly Societies of Australia:

The Representatives of the British Medical Association and of the Friendly Societies appreciate the invitation to co-operate in the Health Services plan of the Federal Government. We, however, request the Government to submit to the British Medical Association and to the Friendly Societies a written statement of its scheme.

Meantime, we have met and exchanged opinions regarding the verbal proposals of the Treasurer.

Upon receipt of the written statement, we shall consult with our respective memberships, again meet and submit suggestions to the Government.

That the Government be requested to make available to the British Medical Association and to the Friendly Societies such actuarial calculations as may assist our deliberations, especially the report of the Actuary of the allocation of the 9d. and 9d. contribution proposed to be charged under the altered Cash Benefit scheme.

To expedite the negotiations and to assist the parties to discuss the charges for the Medical Services, that the Government be requested to arrange for the Royal Commission to complete its deliberations and to report on its findings.

The interested bodies having met at the invitation of the Minister, we request the Government to give consideration to meeting the cost of the present and future conferences.

I have the honour to be, Sir,
Yours faithfully,
(Sgd.) H. S. Newland,
Chairman of Conference.

The Treasurer willingly consented to submit the proposals in writing, and has since done so.

The proposals of the Government are as follows:

March 23, 1939.

Health Insurance and Medical Services Proposals of the Commonwealth Government.

1. For reasons which have been explained, the Government proposes to introduce a scheme of compulsory health insurance which will apply to employees, the majority of whom work under industrial awards, and whose earnings do not average more than £365 per year. The criterion of industrial awards will not be rigidly adhered to, but it will provide the simplest basis for the compulsory contributions.

2. The main object of this scheme is to ensure to the insured persons a continuation of a minimum income during sickness and disablement. The weekly sick pay rates now proposed are 15s. per insured person, 10s. for a wife and 5s. for each dependent child, with an upper limit of 40s. The respective weekly disablement rates now proposed are 10s., 5s. and 3s. 6d., with an upper limit of 25s. The two rates for unmarried minors are 10s. and 7s. 6d. These rates are slightly more costly than the former rates, but are on a family basis, and are the same for males and females.

3. The contributions proposed are 9d. and 9d. for men, and 7d. and 7d. for women and minors. These contributions cannot be collected during sickness and unemployment. The Government grant would be £1,000,000 a year and it will go into the pool with the contributions. The total income cannot be estimated exactly, but the estimated numbers of insured persons are 1,500,000, and the total average annual revenue is likely to be about £5¼ millions.

4. It is estimated that of the 1,500,000 insured persons, about 300,000 would be females, and that about half of the 1,200,000 males would be married men. There are no good figures for the age composition of these groups, but about 27% of the males would be over 45 years of age (the present age limit of entry to friendly society benefit membership).

5. The cash health benefits are, of course, more liberal and expensive than any friendly society or other medical benefit society benefits of the same kind. Sick pay can reach 40s. per week. Disablement benefit can go on indefinitely at the rate of 25s. per week, as compared with a much lesser sum from friendly societies and like organizations. Pending the qualifications of 104 contributions for this benefit, it is proposed to add a transitional benefit continuing sick pay for a further 26 weeks at half rates.

6. Neither the friendly society contributions nor their rates are comparable with those under this scheme. The lowest average cost to a youth entering a friendly society for sick pay benefits is 7d. per week for 52 weeks in a

year. The cost of national insurance cash benefits will be double that weekly sum, for the following reasons:

(*a*) No weekly contributions are due during sickness and unemployment.

(*b*) The benefits are more liberal and costly.

(*c*) The risks cover men over age for admittance to any voluntary scheme, and men who cannot gain admittance because of their health.

(*d*) "Sickness experience" (qualifying for cash benefits) has increased in recent years, and both claims and certificates for claims against national insurance funds are not likely to be on any reduced scale.

(*e*) The approved societies must be provided with some slight margin to cover the risks in (*d*), or, alternatively, to be available for "additional benefits" in subsequent years.

7. An actuarial report will, of course, be submitted to Parliament when a bill is introduced. At present it appears that a sum of about 13½d. must be credited to approved societies in respect of each contribution for males, and about 11½d. in respect of each contribution for females. The contributions in respect of adult males will therefore leave a margin of about 3½d. for medical benefit. The contribution in respect of adult females will leave a margin of about half that sum.

8. The amount of the proposed subvention in aid of medical services is £1 per insured person, or an aggregate of about £1,500,000. When this cost is added to the costs in respect of approved society liabilities and of administration, the estimated contribution revenue is short by £1,000,000. This sum is to be contributed as a Commonwealth Treasury grant. Per insured person it is one-third greater than the grant to the health insurance fund in the present Act.

9. The information explains briefly the reason for the limitation in the funds available for the proposed subvention in aid of medical services. The insurance principles which govern the financing of approved societies will be familiar to friendly society experts, although under State laws they are not left to the discretion of the societies. The States impose control to safeguard the interests of the contributors.

All of the funds (*i.e.*, contributions from insured persons, employers and the Government) would be disbursed either to the credit of the approved societies or for medical benefit.

The Medical Service Subvention.

10. The Government has every sympathy with the view that any provision for medical services should be on a family basis, and it believes that a subvention in aid of such a service is preferable to a system of free treatment for insured persons and a separate system of assistance for wives and children. It is also of the opinion that the distribution of the £1,500,000 to be available should be such as to assist families to a greater extent than individuals.

11. It is with these objects in mind that a subvention at a rate per individual in the family has been proposed, but the Government is open to consider any distribution of the total sum available. The problems which require discussion are all concerned with the distribution of the total sum, and various alternatives must be considered.

12. For the insured person, regularly in work, and either a member of or eligible to join a medical benefit society, the problem is simple, and it can be outlined from this point of view before proceeding further. For these people there is little or no need to disturb existing arrangements, as they exist among various groups in various parts of Australia. The proposed Government subvention would simply reduce the cost to an insured person of membership of a society of his own choice.

13. Two essentials must be mentioned. The payment of a subvention must be conditional upon approval of the organization concerned, and of its scope of medical service. These problems present no great difficulties. The second essential is that the subvention must cover certification for the cash benefits provided through the approved societies. It will be obvious that some system must be devised to settle any disputes that may arise from the approved societies concerning certification. This is one of the problems requiring discussion.

14. For persons unwilling or unable to join any such society, the same subvention could be paid in respect of medical expenses otherwise incurred. Such expenses might or might not be for services within the scope of medical benefit society practice. The subvention might be paid only in respect of claims for sick pay. These are matters which are very suitable for discussion, and at present the alternatives need not be elaborated.

Additions to Present Benefit Conditions.

15. There are, however, additional liabilities which may be incurred with the object of liberalizing the conditions and ensuring continuity of medical service to insured persons and their families. The objects which the Government has in view are:

(*a*) To have medical service available to all insured persons and their families, irrespective of their present eligibility to become members of medical benefit societies, either because of age or health.

(*b*) To provide in whole or in part for the cost of the minimum service during sickness and unemployment.

(*c*) To provide for the continuance of the service during old age; and

(*d*) To continue the subvention for the widows of insured men.

16. It is possible that medical benefit societies catering for the public, and the medical profession (together with the pharmacists), may be able to agree upon terms to cover at least the inclusion of all insured persons in a satisfactory scheme. The Government desires that all of the extensions outlined above should be discussed. At the same time, however, the rates to be charged to insured persons for the benefits to be provided is a vital consideration. If the rate is to be different from the rate for other persons, or if it is to be substantially increased, some other way may need to be devised for dealing with these problems, so far as they can all be dealt with at present.

17. The actual procedure for using the funds to become available may need to be the subject of considerable discussion. The simplest procedure may be to divide the fund into parts, and to use it so as to cause the least possible disturbance to existing voluntary arrangements. Thus a part could be used as a general subvention reducing the contributions now paid to medical benefit societies by those able to join them under existing rules. Another part might be used to compensate doctors and chemists for the inclusion at the same rates of contributions of persons now excluded. Special sums could be agreed upon and allocated by representative bodies. A third part of the fund might be used to provide for extra benefit conditions set out above.

Other alternative procedures can suggest themselves.

18. The general proposals of the Government will be seen from the above. The starting point has been made clear, and the general objections have been described. It will not be possible to achieve all the objectives at once. It is expected that medical benefit societies should be able to attract increasing numbers of insured persons to their memberships. There are advantages in the decentralized control of medical benefit services, allowing of different scopes of medical services and of arrangements to suit local, employee, and other special groups.

The Government proposals do not require any standardization of practice, or of rates, or uniformity in the scope of medical service, provided that a prescribed minimum of medical service is provided. The proposals at present simply provide opportunities for voluntary arrangements, and if the problem of certification can be dealt with adequately there is no reason why voluntary systems could not meet the needs of the situation and continue as the basis for any increased expenditure on medical service that may become possible in the future.

Hospitals.

THE TRAINING OF NURSES.

Sir James Barrett writes that he has been making inquiries in Vancouver, British Columbia, from Dr. G. F. Strong, regarding the training of nurses. Dr. Strong referred Sir James Barrett's inquiry to Miss Grace M. Fairley, Director of Nursing at the Vancouver General Hospital and President of the Canadian Nurses' Association. In view of the importance of the subject, Miss Fairley's reply to Dr. Strong is published herewith.

Dear Dr. Strong,

Replying to your letter of January 13, I am happy to give you the information you request and have, as suggested, mailed under separate cover a calendar of our school, which I think is in many points similar to that of other hospitals of like size in the Province and Dominion.

In direct answer to Sir James Barrett's questions:

1. The preliminary education required by those who wish to become nurses.—The preliminary education is a minimum of junior matriculation (entrance to provincial university). The outline as required by the Department of Education is enclosed herewith.

2. Do they receive any training in the interval between leaving school and entering a hospital?—There is no organized training in Canada for prospective applicants to hospitals. However, encouragement is given to applicants to continue with their general education as far as possible. In other words, students with senior matriculation or college credits would receive preference, all other things considered. The four months' preliminary term comprises part of the three years' course.

3. What is the length of time occupied in qualifying:

(*a*) As a general nurse? Three years.

(*b*) As an obstetric nurse in addition to (*a*)? Obstetrics is included in the three years' course.

4. Whilst in hospital are they in any cases taught as medical students are, or do they, as with us, do the hospital routine work as trainees?—Student nurses do not go in our wards until they have been taught in the classroom all the essential procedures of routine nursing care, which as a rule takes about two months. They are then in the wards for a limited length of time while being taught special medical and surgical procedures and more advanced nursing technique. In the intermediate and senior years the majority of experience is given in the wards, which includes routine nursing care. Clinical instruction in the wards is given throughout the whole course as well as in the classroom, although lectures in certain special departments, such as obstetrics, pædiatrics, and operating room technique, is having practical experience in the service.

To further comment on the point brought out in Sir James Barrett's letter relative to the waste of time between school leaving and entering a hospital, it is true that the average student nurse entering a hospital immediately upon leaving school or college is more receptive as a student; but as a rule this is offset by the fact that she is too young and immature. Nineteen is the minimum age for admission to schools in this province, and frequently applicants have completed their matriculation at an earlier age; but here we give preference to those of more mature age. From a good many years of experience I have found that students who have a good general education and who have had some general experience, either advanced education or other type of training (teaching, business course, etc.) are usually more mature and have the qualities of character that are more acceptable than the very young pupil who has just left school.

In this province, as you know, for the young woman who can afford to take the university course, we have the five-year course at the University of British Columbia leading to a degree in science, with one special elective year in either public health or hospital administration and teaching. While this course was primarily organized to develop leaders in the profession, it has also been reasonably successful as a preparation for students who are too young to enter hospital and who are financially able to do so, to take the longer and broader course. The outline of the university course is to be found on page eleven of the calendar.

I think I mentioned to you that I am averse to accepting students earlier than nineteen, as I note so many of the schools in Britain are doing at the present time. The responsibility that we are putting on nurses of the present day is too great for the shoulders of "eighteen-year-olds". May I say that in watching the discussions relative to shortage of nurses and applicants in some of the other countries, my personal opinion is that reducing the age for admission is not the best way of overcoming this. In Canada we have experienced cycles of shortage of nurses following the Great War, but I think all good training schools will admit that raising of the educational standards and adhering strictly to the minimum age of nineteen or twenty years for admission has in no way affected the number of applicants; in fact I think it has rather increased the interest.

In latter years we have, through our nursing organizations, kept closer in touch with the departments of education and principals of high schools, who, I think, are doing very much more in the way of vocational guidance. Through them we strongly urge that young girls who have any thought of taking up such a profession should concentrate on such subjects, as chemistry, algebra and advanced arithmetic (especially the metric system, decimal fractions, and percentages) in their matriculation course, as being the basic subjects in a nursing course.

I have written at some length and also offered my personal opinion on several points, which may or may not be of interest to you. If there is any further information that you would like, please do not hesitate to ask me.

Sincerely yours,

(Signed) Grace M. Fairley,

Director of Nursing.

Medical Practice.

VICTORIAN BLOOD TRANSFUSION SERVICE.

The following information concerning the Red Cross blood transfusion service in Victoria is published at the request of the Medical Secretary of the Victorian Branch of the British Medical Association.

The Red Cross Society has undertaken the organization of a donor service for private patients, and in order that the service may fulfil its ideals, it is insisted that medical men using the service should be experienced in the modern technique of blood transfusion.

Doctors using the service should have appropriate apparatus available. The needle method of obtaining blood must be used, and the vein of the donor must not be cut down upon. Some doctors prefer to make a small nick in the skin to facilitate the passage of the needle, and this is permissible; but ligation and insertion of a cannula into the donor's vein, or any operation which may prevent the further use of the vein for transfusion purposes is prohibited.

Fees.—The doctor is asked to explain to the patient or relatives that a fee will be charged for the services of the donor, and will be payable to the Red Cross Transfusion Service. The fee is £6 6s., and the service retains £1 1s. for expenses, the remainder being available to the donor. Many of the professional group donors are university undergraduates. If the donor does not accept his or her portion the money is used for the maintenance of the service.

When a donor is called and not used, a fee of £1 10s. will be charged to the patient.

Where possible the use of relatives or friends of the patient is strongly recommended to minimize the demands on the service donors.

Typing of Donors.—Group typing of the patient and the use of a donor belonging to a similar group is in the best interests of the patient. This also assists the service by reducing the calls on universal donors, of whom there are only a limited number.

The final responsibility for compatibility of a donor rests with the medical man performing the transfusion, and it is strongly recommended that direct typing between the patient and proposed donor be performed immediately before a transfusion is given.

A Wassermann test is performed at intervals on the serum of the donors, but the service accepts no responsibility for the possible transmission of disease.

Reports.—A report form will be posted to the doctor who calls a donor, in order that a brief statement on the transfusion may be sent to the service. This report must be returned to the office within seven days.

Method of Obtaining Service of the Donors.—Telephone the Royal Melbourne Hospital (Central 9001) and ask for the transfusion service clerk.

Further information may be obtained from the secretary of the transfusion service, Miss Dickins (F 1671).

The service arranges the typing of donors, keeps records, maintains a telephonist at the Royal Melbourne Hospital, and arranges transport and expenses of donors. The maintenance of this organization depends upon the fees collected, and the medical profession is asked to cooperate in every possible way.

University Intelligence.

UNIVERSITY OF MELBOURNE.

THE following are the details of a course of lectures in criminology to be given in the Faculty of Arts of the University of Melbourne in first and second terms, 1939, by Dr. Anita Mühl (B.Sc., M.D., Ph.D., F.A.C.P.), visiting lecturer in psychiatry.

Lecture I, April 18, 1939.—Basic lecture on types of personality. Different types commit the same crime for different reasons. Introverts; extraverts. Suggestibles; resistives. Aggressives; inferiors. Mentally normal. Mentally deficient. Mentally superior. General attitudes toward authority.

Lecture II, April 25, 1939.—Crimes. Crime a relative term. Safer to say, "offence against the criminal law". That which is a crime in one country may not be a crime in another country. (*a*) Same crimes committed by different types as a result of different stimuli. (*b*) Crimes to be considered: arson, vandalism, stealing, sex crimes, forging, counterfeiting, blackmailing and slander, kidnapping, murder and atrocious crimes.

Lecture III, May 2, 1939.—Stealing, an offence against the criminal law, which may be due to: (*a*) deprivation, (*b*) compensatory activities, (*c*) "kleptomania", (*d*) "getting even", (*e*) "keeping up with Jones", (*f*) habit of stealing. Seen in childhood, beginning: (*a*) as cheating, (*b*) as result of having been taught to steal, (*c*) as a result of desire to keep up pretences, (*d*) as a result of desire for approbation and attention, (*e*) as vandalism.

Lecture IV, May 9, 1939.—Stealing, an offence against the criminal law developing in adolescence, appearing as: the small thief, petty larceny, grand larceny, "con. man", brutal hold-up man.

Lecture V, May 16, 1939.—Sex crimes, offences against the criminal law beginning in childhood and carrying through senility: (*a*) sex exhibitionism, (*b*) "peeping", (*c*) criminal assault, (*d*) mutilations, (*e*) bestiality of senility. The types of people who commit sex crimes and the psychological reason for the development of such behaviour. Arson and vandalism as sex equivalent behaviour.

Lecture VI, June 6, 1939.—Blackmail and "poison pen" addicts. Psychopaths long at blackmail. The paranoid character of the poison pen group. Malicious slander. The type of mental conflict resulting in this form of behaviour. Cases.

Lecture VII, June 13, 1939.—Forging, counterfeiting—offences against the criminal law as a rule involving those of higher intelligence. Planning required, skill involved. Artistic ability misdirected. Psychopaths frequently arch swindlers later become counterfeiters. Pose as gentlemen, as wealthy people, as cultured and professional people; plausible, frequently parasites on others. The psychopath is so egocentric he is utterly incapable of loving anyone but himself.

Lectures VIII and IX, June 20 to 27, 1939.—Murder, an offence against the criminal law due to many causes. The dope addict. The alcoholic. The paranoid. The paranoid præcox, manic rage. Psychopathic inferiority. The mental defective as tool. Motives: retaliation, revenge, identifications, hallucinatory, self-defence, exhibitionism, sadism, feeling of guilt and desire for punishment, domination by a stronger mind.

Lecture X, July 4, 1939.—The epileptic in crime. Atrocious crimes. Mutilations after death. Cases showing how these personalities use equivalent behaviour of violence instead of the convulsive seizure.

Lecture XI, July 11, 1939.—Methods of criminal investigation. The necessity for clear observation and recording. The evaluation of clues. Laboratory tests of materials, dust, finger nail scrapings *et cetera*. Ballistics, Handwriting experts. Finger prints and measurements. The "psychological third degree". The "lie detector" (Keeler polygraph).

Lecture XII, July 18, 1939.—Methods of examining witnesses. Direct examination. Indirect examination. Reliability of witnesses.

Lecture XIII, July 25, 1939.—The Watters case.

Lecture XIV, August 1, 1939.—Modern methods of treatment: (i) Disciplinary schools for children, with attention to occupational therapy, building character traits *et cetera*. (ii) Correctional schools *et cetera*. Some new ideas of staffing. (iii) Prisons, penitentiaries.

Lecture XV, August 8, 1939.—Modern methods of prevention: (i) Mental hygiene in pre-school and early school periods. (ii) Adolescent care; clinics; councils of vocational guidance. (iii) Child-parent relationship study groups.

The lectures will be delivered in the Arts Building of the University of Melbourne. Each lecture will be delivered twice—at 5.15 and at 8 o'clock p.m. All members of the university and colleges will be admitted free. A registration fee of 2s. 6d. will be payable by other persons desiring to attend. The fee should be paid at the door on the occasion of the first lecture attended.

Correspondence.

THE TREATMENT OF INFANTILE PARALYSIS.

SIR: In THE MEDICAL JOURNAL OF AUSTRALIA dated March 18 there are two letters signed by W. Kent Hughes and Rae W. Dungan.

I am surprised indeed that this type of correspondence should be allowed to appear in the journal. Neither of these letters discusses the treatment of anterior polio-

myelitis in a proper manner, but as I read them, the one is an attempt to discredit the work of our late esteemed friend and teacher, Sir Colin MacKenzie, and the other to belittle the work of muscle reeducation carried out by members of an associated professional body.

Both of these letters contain incorrect statements.

Mr. W. Kent Hughes states: "MacKenzie promulgated his absurd theory that infantile paralysis was purely a muscular affection."

I would refer him to a reprint from *The British Medical Journal*, January 9, 1915, "The Treatment of Infantile Paralysis", by MacKenzie, in which are these statements: "The essential feature of this disease is an inflammatory affection of the cells of the anterior cornua of the spinal cord resulting in a paralysis of the corresponding muscle groups. The inflammation may not be limited to the anterior cornual cells, but may affect other portions of the spinal cord and meninges." Also: "My conclusions were: 1. That as a primary pathological factor the muscle by itself could scarcely be considered. 2. That biologically, however, it was all important for the purpose of treatment."

The position of rest of a muscle is still under discussion, but position of support of a part is for a dual purpose. 1. Rest to the affected muscle or muscles. 2. Prevention of contraction and adaptive shortening of the unaffected opponent muscles.

A foot with paralysis of the dorsiflexors fixed in plantar flexion by contraction of the *tendo Achillis* is certainly a difficult problem to deal with.

Dr. Macnamara, I am sure, will reply to the statement that she "kept patients closely confined for periods up to five or seven years without any movement at all".

Dr. Dungan's statement that the treatment of the cases was carried out by trained nurses alone is not correct. A competent physiotherapist was attached to the department. At Carshalton Beeches, England, the work was done by members of the massage department.

If Dr. Dungan has any knowledge of what constitutes reeducation, he should realize that it is only another type of applied science and can only be properly carried out by those who have the necessary knowledge of the basic principles.

Yours, etc.,

HAROLD CRAWFORD.

"Inchcolm",
Wickham Terrace,
Brisbane, B.17.
March 23, 1939.

[This correspondence is now closed.—EDITOR.]

A PLEA FOR COOPERATION.

SIR: In a number of cases of typhoid fever which have recently occurred in Sydney, a considerable delay has ensued before notifications have been forwarded by medical practitioners. In some instances the delay appears to have been due to the fact that diagnosis has not been made until late in the illness.

Though a medical practitioner is not legally required to notify cases merely "suspected" of being typhoid fever, it would be a considerable assistance to this department if metropolitan practitioners would intimate their suspicions regarding any particular case to the Metropolitan Medical Officer of Health (Dr. J. G. Drew), telephone B06, extension 912.

By such collaboration further light might be shed on the diagnosis following investigation into the patient's previous movements, while at the same time the chance of tracing the source of the disease will be considerably enhanced.

Yours, etc.,

E. SYDNEY MORRIS,
Director-General of Public Health.

Winchcombe House,
52, Bridge Street,
Sydney.
March 28, 1939.

WHAT PRICE VITAMINS?

SIR: Last week, Mr. B., a miner, aged thirty-four, consulted me. He required glasses; vision, media and fundi were normal; he had slight hypermetropia. In the course of routine questioning as to his health and digestion I elicited the following dietetic details. He had never, he stated, eaten green vegetables, fresh or canned fruit of any kind, nor had he ever eaten an egg. His health had always been excellent, except for acute appendicitis, for which he was operated upon two years ago. His teeth were good. His diet consists of meat, gravy and potatoes, white bread, butter and treacle. The only jam he has ever tasted is raspberry, which he occasionally has; it is the only fruit he even knows the taste of.

In physique he is of average height, square-shouldered and muscular; there was no trace of miner's nystagmus nor any history of delayed dark-adaptation in the mines.

His married sister also has never eaten green vegetables, fruit or eggs. Her health, like his, is excellent, though she is inclined to be stout, having given birth to nine children, in spite of the insufficiency of the "fertility" vitamin *E*. Perhaps her husband is fond of water-cress!

Yours, etc.,

A. W. D'OMBRAIN.

Bank Chambers,
17, Bolton Street,
Newcastle.
March 29, 1939.

THE TREATMENT OF INFANTILE PARALYSIS.

WE are in receipt of a letter from Dr. Jean Macnamara, of Melbourne, in which she takes strong exception to remarks by Dr. W. Kent Hughes in a letter published in the issue of March 18, 1939, to the effect that she kept poliomyelitis patients confined for periods up to five or seven years without any movement at all.

In order to vindicate her position Dr. Macnamara has asked us to publish portion of an article written by her which appeared in the *Canadian Public Health Journal* of November, 1932. We are happy to comply with her request. The portion of the article appears hereunder and is published with the consent of the editor of the *Canadian Public Health Journal*.

Saline Baths:—Soon after the onset of paralysis, daily immersion in a warm bath of hypertonic saline is valuable in alleviating tenderness. Patients look forward to the time spent in the bath. Later, while in the saline, the patient may be allowed to carry out gentle movements. The support given by the hypertonic saline makes movements easier than in air, and thus the movements induce less fatigue. Such gentle movements lessen any tendency to limitation of the range of joint movements.

Muscle Re-education:—By this is meant the art of coaxing any surviving muscle fibres to bring about a limited number of contractions of the muscle: to guide the patient, by mental concentration, to send messages from his cortex to surviving neurones which, before the lesion occurred, may not have been accustomed to functioning together, but which can learn to do so. "Parts that have functioned together, tend to function together more easily again." When a partially paralyzed muscle contracts, it not only improves the nourishment of its fibres, but also the co-ordination of the neurones which supply it, provided that the contractions be not continued long enough to induce fatigue. Muscle re-education requires, on the part of the person undertaking the work, an accurate knowledge of anatomy and of the action of muscles, if she is not to be deceived by "trick" movements; that is, by movements carried out by the contraction of normal muscles, and not by the paralyzed muscles. . . . The physiotherapeutist should appreciate the influence of gravity, in grading degrees of paralysis, and in planning

exercises adapted to the varying requirements of the muscles she is trying to nurture to recovery. She must be able to record accurately the grades of paralysis in individual muscles, according to the standard adopted in the community in which she works . . .

The physiotherapeutist should be alert to recognize the first evidence of actual shortening of any muscle, to prevent its contracture and deformity. She should appreciate the principles of posture, in order to hold her patient in good position, while recumbent, and later to guide him to the best way of carrying his body weight. The equipment she requires is simple; several pillows, a tin of powder, and one or two pieces of three-ply wood. A convenient size is three feet by two feet six inches, prepared with rounded corners, smooth edges and one side slightly polished and smoothed by sand papering. By adjustment of the pillows, on which the board is placed, the physiotherapeutist is able to vary the inclination of its plane and thus adapt each exercise to the capacity of the muscle, at each stage of recovery. When given by an expert, who has served a long apprenticeship in its exacting art, muscle re-education is of the greatest value. *Its place, however, in the treatment of paralysis, should be regarded as auxiliary, and subsidiary to measures taken to ensure the fundamentals,*—relaxation of affected muscles and their protection from fatigue. Economic factors frequently make daily expert treatment impossible. When the patient has been trained for several weeks, it may be possible to compromise, by teaching the parent to carry out a number of simple, relatively safe exercises, under supervision at weekly intervals. At her visits the physiotherapeutist will detect and correct any trick movements, and determine whether the parent, in her anxiety to accomplish, has lost by inducing fatigue.

Exercises Under Water.

In some centres, where numbers of patients are gathered for treatment, large pools for giving exercises under water have been installed. These are valuable at a late stage of the treatment, when all the muscles have reached the grade of good or normal, when the exercise in water bridges the gap between exercises while recumbent, and exercises with weight bearing. In another group of cases, severely paralyzed by the initial lesion, exercises under water serve to develop muscles unaffected by the disease.

Congresses.

AUSTRALASIAN MASSAGE ASSOCIATION CONGRESS.

The second interstate congress of the Australasian Massage Association will be held at Melbourne on May 1 to 5, 1939. The programme is as follows:

Monday, May 1.

11.30 a.m., reception to visitors, luncheon; 2 p.m., visit to Children's Hospital (Orthopædic Branch), Frankston; 8.15 p.m., lecture by H. Douglas Stephens, M.D., M.S., F.R.C.S. (England), F.R.A.C.S., Union Theatre, University of Melbourne.

Tuesday, May 2.

9.30 a.m., Children's Hospital, Carlton, clinical demonstration by Dr. Jean Macnamara; 2 p.m., Children's Hospital, Carlton, demonstration in plaster technique by John B. Colquhoun, F.R.C.S. (England), F.R.A.C.S.; 4 p.m., visit to the Chamber of Manufactures Industrial Clinic, Mr. John Eddy.

Wednesday, May 3.

9.30 a.m., Alfred Hospital, demonstration, manipulation of stiff joints; film, "Manipulation", C. H. Hembrow, F.R.C.S. (England), F.R.A.C.S.; demonstration by members of Physiotherapy Department, (*a*) posture exercises, (*b*) injuries, (*c*) lantern slides, cases of spastic paralysis, Miss J. V. Boyes, C.S.M.M.G., Dip.A.M.A. (Tasmania); 8.15 p.m., lecture by Clive Fitts, M.D., M.R.C.P. (England), Royal Australasian College of Surgeons Hall.

Thursday, May 4.

9 a.m., Royal Melbourne Hospital, clinical demonstration by C. W. B. Littlejohn, F.R.C.S. (England), F.R.A.C.S.; 11.30 a.m., visit to Montague Day Clinic; 2 p.m., Royal Melbourne Hospital, clinical demonstration by Leigh T. Wedlick, M.R.C.P. (London); 7.30 p.m., official dinner.

Friday, May 5.

9 a.m., Saint Vincent's Hospital, clinical demonstration by Thos. King, M.D., F.R.C.S. (England), F.R.A.C.S.; clinical demonstration in Physiotherapy Department, Frank May, M.B., B.S., B.Sc., D.M.R.E. (Cambridge); 2 p.m., Royal Melbourne Hospital, series of short demonstrations by visitors and local members. These will include Dr. Alpers (South Australia), subject to be chosen; physical treatment for heart cases, Miss Elmo Casely, Dip.A.M.A., C.S.M.M.G. (London) (South Australia); prenatal and postnatal exercises (South Australia); occupational therapy, Miss Docker (New South Wales); scoliosis, Miss A. McA. Campbell, Dip.A.M.A., C.S.M.M.G. (London); splints, appliances. 8.15 p.m., lecture by A. E. Coates, M.D., M.S., F.R.A.C.S., Royal Australasian College of Surgeons Hall.

Proceedings of the Australian Medical Boards.

TASMANIA.

The undermentioned has been registered, pursuant to the provisions of the *Medical Act*, 1918, of Tasmania, as a duly qualified medical practitioner:

Lomax, Raymond Frederick, M.R.C.S. (England), L.R.C.P. (London), 1930, Port Cygnet.

QUEENSLAND.

The undermentioned have been registered, pursuant to the provisions of *The Medical Acts*, 1925 *to* 1935, of Queensland, as duly qualified medical practitioners:

Boscence, William Edward Bruce, M.B., B.S., 1937 (Univ. Sydney), Townsville.

Brookfield, William Melville Will, M.B., B.S., 1937 (Univ. New Zealand), Townsville.

Lennon, Vincent Francis Bennett, M.B., B.S., 1930 (Univ. Adelaide), Rockhampton.

Madden, Kenneth Charles Moloney, M.B., B.S., 1938 (Univ. Sydney), Brisbane.

Obituary.

RAYMOND ALLISON KEYS.

We regret to announce the death of Dr. Raymond Allison Keys, which occurred on March 27, 1939, at Eumundi, Queensland.

Nominations and Elections.

The undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Alexander, Munro Scott, M.B., B.S., 1939 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

Finkle, Edmund Wesley, L.R.C.P. (Edinburgh), 1937, L.R.C.S. (Edinburgh), 1937, L.R.F.P.S. (Glasgow), 1937, Gizo, British Solomon Islands.

Hammond, Charles William, M.B., B.S., 1939 (Univ. Sydney), West Wallsend.

MacMahon, Christine Helen Mary, M.B., B.S., 1930 (Univ. Sydney), Broughton Hall, Leichhardt.

Books Received.

PYE'S SURGICAL HANDICRAFT: A MANUAL OF SURGICAL MANIPULATIONS, MINOR SURGERY AND OTHER MATTERS CONNECTED WITH THE WORK OF HOUSE SURGEONS AND OF SURGICAL DRESSERS, edited by H. Bailey, F.R.C.S.; Eleventh Edition; 1939. Bristol: John Wright and Sons Limited. Demy 8vo, pp. 530, with 362 illustrations. Price: 21s. net.

A SYNOPSIS OF MEDICINE, by H. L. Tidy, M.A., M.D., B.Ch., F.R.C.P.; Seventh Edition, revised and enlarged; 1939. Bristol: John Wright and Sons Limited. Crown 8vo, pp. 1208. Price: 21s. net.

POCKET MONOGRAPHS ON PRACTICAL MEDICINE: DIETETICS IN GENERAL PRACTICE, by L. Cole, M.A., M.D., F.R.C.P.; 1938. London: John Bale, Sons and Curnow Limited. Foolscap 8vo, pp. 162. Price: 6s. net.

RECENT ADVANCES IN CHEMOTHERAPY, by G. M. Findlay, C.B.E., M.D., D.Sc., with a foreword by C. M. Wenyon, C.M.G., C.B.E., M.B., B.S., F.R.S.; Second Edition; 1939. London: J. and A. Churchill Limited. Large crown 8vo, pp. 533. Price: 21s. net.

Diary for the Month.

Apr. 11.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
Apr. 14.—Queensland Branch, B.M.A.: Council.
Apr. 18.—New South Wales Branch, B.M.A.: Medical Politics Committee and Ethics Committee.
Apr. 19.—Western Australian Branch, B.M.A.: Branch.
Apr. 20.—New South Wales Branch, B.M.A.: Clinical Meeting.
Apr. 26.—Victorian Branch, B.M.A.: Council.
Apr. 27.—New South Wales Branch, B.M.A.: Branch.
Apr. 27.—South Australian Branch, B.M.A.: Branch.
Apr. 28.—Queensland Branch, B.M.A.: Council.
May 2.—New South Wales Branch, B.M.A.: Organization and Science Committee.
May 3.—Victorian Branch, B.M.A.: Branch.
May 3.—Western Australian Branch, B.M.A.: Council.
May 4.—South Australian Branch, B.M.A.: Council.
May 5.—Queensland Branch, B.M.A.: Branch.
May 9.—New South Wales Branch, B.M.A.: Executive and Finance Committee.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser", pages xvi to xviii.

Cairns Hospital Board, Cairns, Queensland: Assistant Medical Officer.
Commonwealth of Australia, Department of Health: Medical Officer.
Department of Public Health, Western Australia: Medical Officer.
St. George District Hospital, Kogarah, New South Wales: Resident Medical Officers.
The Women's Hospital, Crown Street, Sydney, New South Wales: Resident Medical Officer.
Western Australian Public Service: Junior Medical Officers.

Medical Appointments: Important Notice.

Medical Practitioners are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
New South Wales: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phœnix Mutual Provident Society.
Victorian: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
Queensland: Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
South Australian: Secretary, 178, North Terrace, Adelaide.	All Lodge appointments in South Australia. All Contract Practice Appointments in South Australia.
Western Australian: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.

Editorial Notices.

Manuscripts forwarded to the office of this journal cannot under any circumstances be returned. Orginal articles forwarded for publication are understood to be offered to The Medical Journal of Australia alone, unless the contrary be stated.

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